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CONTRIBUTIONS OF PATIENT CHARACTERISTICS AND ORGANIZATIONAL FACTORS TO PATIENT OUTCOMES OF DIABETES CARE IN HUALIEN, TAIWAN

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CONTRIBUTIONS OF PATIENT CHARACTERISTICS AND ORGANIZATIONAL FACTORS TO PATIENT OUTCOMES OF DIABETES CARE IN HUALIEN, TAIWAN

by

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Dissertation

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Dedication

This dissertation is dedicated with love and respect to my parents, Chin-Li and Hsiu-Feng T. Chang, and my husband, Hou-Duen Shih. They are a constant source of support.

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CONTRIBUTIONS OF PATIENT CHARACTERISTICS

AND ORGANIZATIONAL FACTORS TO PATIENT OUTCOMES

OF DIABETES CARE IN HUALIEN, TAIWAN

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This cross-sectional study measured quality of diabetes care and explored the contributions of patient and organizational factors to patient outcomes of diabetes care in Hualien, Taiwan. Donabedian's structure-process-outcome framework was applied to examine the system of health care in Hualien County with respect to the quality and outcomes related to patients with diabetes.

One hundred forty participants were randomly selected from the list of individuals with diabetes who were seen at the medical center in Hualien during 2000 and 2001. Data collection included administering questionnaires through the mail or by direct interview in early 2003 and reviewing medical records over the course of the year 2002.

Patient characteristics (gender, age, education, ethnicity, occupation, length of time since diagnosis, pattern of diabetes treatment, and comorbidity) and organizational factors in terms of structure (institute characteristics and physician specialty) and the care process (patient-physician relationships, organizational collaboration, and preventive monitoring and diabetes education) were examined in light of their contributions to patient outcomes: glycemic control, adherence to self-care regimen, and quality of care .

Findings included: three patient outcomes of diabetes care, diabetes professional performance, and contributions of patient and organizational factors to the outcomes. The average A1C level was 8.27%; patient adherence to self-care regimen was moderate. Scores of patient perception of quality of life were lower in physical and psychological domains but higher in social relations and environmental domains than scores in other studies. Data about professional performance showed a need to improve preventive care for patients.

Regression procedures highlighted the contributions of patient and organizational factors to patient outcomes. The structure of care (institute characteristics, and physician specialty) accounted for 8.1 % of the variation in glycemic control. Patient characteristics (level of education and ethnicity) and organizational factors (structure and process, health institute characteristics and patient-professional relationships) accounted for 23.0% of the variance in adherence to self-care. Patient characteristics (patient ethnicity and comorbidity) and interpersonal processes of care (patient-professional relationships) accounted for 31.1% of the variance in perceptions of quality of life.

TABLE OF CONTENTS

FIGURES

TABLES

LIST OF ABBREVIATION

A1C Glycosylated hemoglobin

ADA American Diabetes Association

CHB County Health Bureau

DKQ Diabetes Knowledge Questionnaire

DMP Diabetes Mellitus Passport

DOH Department of Health, Executive Yuen, Taiwan

DPPC Diabetes Professional Performance Checklist

DSC Diabetes Shared Care

DSSQ Diabetes-Related Social Support Questionnaire

FPG Fasting Plasma Glucose

IDDM Insulin-Dependent Diabetes Mellitus

NCQA National Care Quality Assurance

NHIB National Health Insurance Bureau, Taiwan

NIDDM Non-Insulin-Dependent Diabetes Mellitus

PPDCQ Patient Perception of Diabetes Care Quality Questionnaire

PSPS Patient Satisfaction with Professionals Scale

SDSCA Summary of Diabetes Self-Care Activities

TADE Taiwanese Association of Diabetes Educators

TCH Tzu-Chi Hospital, Hualien, Taiwan

TG Triglyceride

WHOQOL World Health Organization Quality of Life Questionnaire

CHAPTER I

INTRODUCTION TO THE STUDY

Introduction and Purpose

The purpose of this study was to measure the current quality of diabetes care in *Hualien, Taiwan to identify* the principal socio-demographic characteristics of patients and the features of health care systems that are associated with the quality of diabetes care. The study examined three patient outcomes thought to be indicative of quality of diabetes care: glycemic control, adherence to a diabetes self-care regimen, and quality of life. The ultimate goal of this study was to contribute to an improvement in the structure, process, and outcomes of diabetes care in Hualien.

There are many factors that can influence the quality of health care. Avedis Donabedian, one of the most significant figures in the development of the concept of quality of care, provided a set of criteria for assessing the quality of care based on the extent to which that care contributed to valued outcomes (Donabedian, 1982). These criteria are related to structure, process, and outcomes of that care (Donabedian, 1982). The quality of care of a medical program results from how well the program is designed (structure), implemented (process), and evaluated (outcome). These criteria are closely interrelated and must be monitored constantly in order to achieve the highest quality of care possible.

Some studies have indicated that the structure of a health care organization is central to achieving and maintaining a high quality of care (Zinn & Mor, 1998). Other

studies have emphasized that health care processes must be monitored continuously in order to maintain and assure consistent high quality care (Bonomi, Wagner, Glasgow, & VonKorff, 2002). Still others have suggested that regardless of structure and process, outcome is the most direct and important criterion for an evaluation of the quality of care (Aiken, Sochalski, & Lake, 1997).

The quality of care for a person with chronic disease is more complicated and difficult to evaluate than is the case with an acute disease (Lo, 1998; Mur-Veeman, Eijkelberg, & Spreeuwenberg, 2001; Paterson, Russell, & Thorne, 2001). Diabetes mellitus is a particularly critical chronic disease that needs long-term assessment and evaluation in order to assure a high quality of care. It is a deadly and costly disease, and optimal treatment requires a great number of resources. Control of diabetes relies heavily on the patient's adherence to a self-care regimen that influences almost all facets of day-to day activities. The question of how best to foster and facilitate adherence to a diabetes self-care regimen, thus, becomes an especially important issue for health care providers. The cost-effectiveness of this care is another issue that must be given foremost consideration. Efficient resource utilization is required, along with effective collaboration among professionals, health care systems, and the community as a whole.

Medical criteria such as levels of glycosylated hemoglobin (A1C), the incidence of diabetes complications, and diabetes-related mortality rates are frequently used to evaluate the quality of diabetes care (Bouldin et al., 2002). Long-term complications and mortality rates, however, do not in and of themselves provide adequate indicators of the aspect of structure and process that may need to be changed to improve quality of care.

The outcomes of diabetes care rely not only on professional services but also on patient self-care. Glycemic control in particular requires strict patient adherence to a recommended self-care regimen (Gatling, Hill, & Kirby, 1997), which includes diet, exercise, medication, and self-monitoring. Therefore, self-care behavior may be seen as an intermediate outcome indicator and a possible measure of short-term outcomes for diabetes care (Glasgow & Anderson, 1999; Glasgow, Fisher et al., 1999; Glasgow, Wilson, & McCaul, 1985). The organization of the health care system and the effectiveness of professional performance may serve as additional predictors of quality of diabetes care.

Background

Diabetes is one of the deadliest and costliest diseases in the world. It is a chronic disease that, when poorly controlled, results in severe complications (Gatling et al., 1997). Because of the growing prevalence of diabetes and the increasing costs associated with the disease, many countries, including Taiwan, are currently seeking more effective programs to control this disease and prevent its complications. Therefore, evaluating the quality of diabetes care has come to be seen as a great priority(Chiarelli, Verrotti, di Ricco, de Martino, & Morgese, 1998). Several researchers have studied diabetes care programs in western Taiwan, however, there have been no studies of the quality of diabetes care in Hualien, which is located in eastern Taiwan.

In Taiwan, with a population of 22.34 million people, the number of deaths due to diabetes has consistently increased on an annual basis (C. H. Tseng, 1999a). According to

the Taiwan National Health Insurance Bureau (NHIB) database, in 1998 there were about 540 thousand diabetes patients requiring medication (Tsai, 2000). These patients comprised 2.5% of the population who were prescribed medication. However, the cost of treating these patients represented 11.5% of the total healthcare expenditure: 4.3 times higher than the average cost of health care for individuals receiving medical treatment for reasons other than diabetes (C. H. Tseng, 1999a). This is one major reason why diabetes has become an especially important issue in Taiwan. While the Department of Health (DOH) has endeavored to achieve greater control over the disease, there are a number of problems associated with diabetes care in Taiwan that present formidable obstacles to its success. In what follows, therefore, the problems associated with diabetes care in Taiwan are discussed in light of available information sources.

Diabetes in Taiwan

Diabetes is the second most common chronic disease in Taiwan after hypertension (Tai, 1996). About 97 % of individuals with diabetes have type 2 diabetes (Chuang, Tsai, Huang, & Tai, 2001). The prevalence of type 2 diabetes in persons over the age of 40, in Taipei, the capital of Taiwan, has been steadily increasing, from 5.1% in 1970 to 8.17% in 1985 (Tai, 1996). In 1990, according to a community-based studies of people over 30 years old, diabetes affected 12.4% in Pu-Li (Chou, Chen, & Hsiao, 1992)and 6.5% in Kin-Hu, Kinmen (Chou, Liao, Kuo, Hsiao, & Tsai, 1994). Diabetes has moved from the 13th to the 5th leading cause of death and the mortality rate has increased two-fold over the past two decades (Tsai, 2000). In facts, the number of individuals with diabetes in Taiwan is currently estimated to be about one million including 30 to 40

percent of this population that have not yet been diagnosed (Tsai, 2000). In 1998, according to a nationwide, random sampling survey known as the Diabcare project (Chuang et al., 2001), the average age of diabetes patients was about 62 years old and the average length of time since diagnosis was 10 years . Most of the patients have a low level of education n (an average of only 6 years). According to ADA diagnosis standard (pre-prandial BG > 126 mg/dl or positive GOTT), the prevalence of diabetes in females who are more than 45 years old (17.4%) was greater than that in males (8%) (DOH Taiwan, 2002). Half of these patients are obese (BMI >25 kg/m^2 for Asian) and sixty percent do not have their diabetes under good control (Glycosylated hemoglobin [A1C] >7.4 %). Forty percent of the patients, furthermore, are in need of more intensive treatment (Chuang et al., 2001).

In 1991, an epidemiological survey of type 2 diabetes in Taiwan showed the prevalence of diabetic retinopathy, neuropathy, and nephropathy were 24.0%, 23.5% and 12.9%, respectively (Tai et al., 1991). By 1998, this percentage has increased to 31%, 30%, and 17%, respectively (Yang, Hwang, Chiang, Chen, & Tsai, 2001, see Table 1). The incidences of complications are presented in Table 1. About one quarter of the patients in need of dialysis in Taiwan were found to be diabetes patients. Diabetes was also found to be the most common cause (37.2%) of lower extremity amputations (Tsai, 2000). Many people were found to already have complications when they were first diagnosed with diabetes (Chuang et al., 2001). Clearly, therefore, the severity of diabetes complications is a very chronic problem in Taiwan.

Table 1. Diabetes Complications among Patients in Taiwan, 1998 (N=2,440)

(Yang et al., 2001)

Complication	Prevalence (%)
Retinopathy	31
Cataract	38
Blindness	1
Neuropathy	30
Proteinuria	17
Renal failure	1
Myocardial infarction	4
Stroke	6
Amputation	1
Foot ulcer	6

Some researchers have analyzed the risk factors associated with diabetes complications. An association was found, for example, between smoking and diabetic foot disease (Tai, 1996). Female gender has also been found to be significantly associated with leg vessel disease. In addition to obesity, serum cholesterol level was also found to be associated with macrovascular complications (Chang et al., 2000; Tai, 1996). Obesity, cholesterol level, hypertension, smoking, and parental diabetes are all correlated with the presence of diabetes and its complications in Taiwanese society.

Unsatisfactory glycemic control generally leads to further diabetes complications, and can even lead to potentially lethal accidents. Visual complications resulting from poor glycemic control, for example, may lead to a proneness to accidents, especially among older patients (DOH Taiwan, 2001b). Additionally, a four-year study showed that glycemic control is the single most important factor for decreasing retinopathy complications (Chen, 2000; Tai, 1996). Good glycemic control is also associated with a better prognosis for diabetes patients, even at the stage of hemodialysis (C. H. Tseng, 1999b). Microalbuminuria and macrovascular complications are also correlated with glycemic control. The average level of blood glucose before a meal was found to be quite high in Taiwanese diabetes patients (172+70mg/dl) (Tai, 1996). Tseng et al. (1990) compared the glycemic control of diabetes patients in urban and rural areas and showed that about 30% of the patients in rural areas and 40% of patients in urban areas were poorly controlled. As has been clearly established in the literature, the diabetes of many Taiwanese patients is poorly controlled and they are subsequently at high risk for the development of complications. Thus, there is a great need to improve diabetes control in

Taiwan in order to prevent the development of complications among individuals with diabetes.

Good glycemic control requires strict patient adherence to a recommended self-care regimen, which includes diet, exercise, medication, and self-monitoring. However, diabetes patients in Taiwan have generally been found to have poor adherence to their self-care regimens, including exercise, diet control, and foot care (Huang, 1998; Lou, 1999). The results of one study that showed only 30% of patients self-monitored their blood or urine glucose (Chuang et al., 2001). Self-efficacy and awareness were found to be strongly correlated with patient self-care behaviors (Chen, Yeh, & Lin, 1998; Liu, 1999; Wang, Wang, & Lin, 1998). Karter, Ferrara, Darbinian, Ackerson, and Selby (2000) indicated that less education is a barrier for adherence. Because most people with patients have received less than six years of formal education (Liu, 1999), diabetes education for these patients presents an especially difficult challenge for health care providers in Taiwan.

Studies have shown that levels of social support may also influence diabetes self-care behavior (Chiu, 1998; Houng, 1994; Lou, 1999; Wang et al., 1998). Family is often the most important source of social support in Taiwanese culture. For the aged diabetes individuals (average 62), support from offspring is often the center of interpersonal interaction in their daily lives (Lin, 1999). However, some studies have revealed that while diabetes patients perceive a high level of material support from their families, they tend to rate the level of emotional support significantly lower (Chen et al., 1998; Chiang, 1997). Diabetes patients who live in rural areas and those who have young family

members working far away are especially likely to perceive low levels of family support (Chiu, 1998). In addition to social support, patients with diabetes who live in rural areas often lack necessary medical resources, as a result of the uneven geographic distribution of those resources and the overcrowded conditions of specialty clinics (Chiou et al., 2001a). It is evident, therefore, that progress in improving diabetes care in Taiwan is needed.

Diabetes Care in Taiwan

Numerous health care professionals have endeavored not only to conduct clinical and epidemiological studies, but also to develop health education, patient management, and intervention programs. Chang (1993) and Chong and Lin (2000) found that patient awareness, attitudes of diabetes patients, and decreased A1C levels were improved through education programs that included individual and group health education along with group support. Jeng (1997) found that improvement in glycemic control was achieved with an exercise training program. Another education program for a group of people with diabetes, led by physicians in a highly supportive medical center and implemented in a rural, primary care setting, found that the program increased patient awareness, but did not have a significant impact on glycemic control (Tsai, Chen, Chen, & Lin, 1996).

An interdisciplinary approach probably represents the most effective form of intervention for diabetes patients, as opposed to care provided solely by nurses, physicians, or dietitians. A successful program of clinical pathways, for example, was applied to diabetes care with the collaboration of physicians, dietitians, and nurses (Fuh,

Su, Chen, & Chang, 1999). The results revealed significant improvements in patients' adherence to medication, exercise, and diet as well as in glycemic control. Providing care through interdisciplinary collaboration, therefore, seems to be more effective than non-collaborative efforts.

Large-scale diabetes care programs were implemented by the government in Taiwan in 1996. The DOH initiated the use of the Diabetes Mellitus Passport (DMP). The purpose of the Diabetes Mellitus Passport is to increase the awareness of the patient and the health care provider concerning the patient's diabetes control. Initially, the utilization rate of the Diabetes Mellitus Passport was very low because patients did not understand its complicated content and it was time-consuming for professionals to record. A revised version, however, was introduced in 1997 and associated with improved rates of both recognition and utilization (Chen & Lin, 1999). Theoretically, use of the Diabetes Mellitus Passport pathway represents an avenue of information sharing between patient and physician. However, the study was conducted only in a very limited geographical area of Taiwan and no other study was implemented to evaluate the utilization rate of the Diabetes Mellitus Passport.

A diabetes follow-up model has been implemented in the area of public health for many years. Since 1992, the DOH has encouraged and funded hospitals and academic institutes in the development of effective hospital-based diabetes education programs. Since then, forty-nine hospital-based diabetes education centers have been developed. These centers provide health education to diabetes patients who visit the clinics or are discharged from the hospitals. Some hospitals refer patients to public health stations that

can then provide follow-up home visits and promote continuity of care (Chen, Hsiao, & Yeh, 1995). In 1996, the first Diabetes Shared Care (DSC) program was developed in I-Lan County under the support of the DOH. Since then, several bureaus of health in other counties have been developing the Shared Care Programs (Chen, Lin, Huang, Lu, & Lin, 2001).

The Diabetes Shared Care System, adopted from a successful Coronary Artery Disease (CAD) Shared Care Model, was developed to address the problem of patients receiving fragmented care due to uneven geographical distribution of health care resources and overcrowded diabetes clinics. The Diabetes Shared Care System constructed a comprehensive and efficient health care model with a high degree of accessibility, and assured quality and a high degree of coordination among health organizations within a given county (Chiou et al., 2001a). This includes organizations through the health care system, including medical professionals and hospitals, the health insurance system, including the local branch of the NHIB, and the public health system, including the County Health Bureau (CHB). The core components of Diabetes Shared Care include diabetes care providers, the content of care itself, the patients, and the community at large (Chiou et al., 2001a). In the beginning, diabetes professional education was provided to most health care providers. As a result, a consensus about diabetes management emerged, and physicians began to provide diabetes care in accordance with established diabetes management guidelines.

Some studies have suggested that the program implemented in I-Lan County, in accordance with standardized treatment guidelines, improved the quality and therapeutic

effectiveness of care at the same time that it helped to contain the cost of that care (T. L. Chen et al., 2001; Chiou et al., 2001a; DOH Taiwan, 2001b; Ho, 2001; Lee, 2000). Thus, the DOH is still evaluating the possibility of expanding existing disease management care programs based on the diabetes shared care model. However, other studies have indicated negative results with respect to the cost-effectiveness of the Diabetes Shared Care System (Chien, Chiu, & Huang, 2001).

As a result of the organization of multidisciplinary and inter-organizational diabetes care teams, patients were registered and began to maintain their diabetes mellitus passport in order to keep a clinical record of their treatment. Also, with a diabetes mellitus passport, patients have access to diabetes care in a neighborhood primary care clinic, and receive the required subspecialty care or specific laboratory tests that health insurance does not cover in primary care clinics. The Diabetes Shared Care System helps to integrate governmental and non-governmental community resources. With this system, hospital and primary care patients, along with physicians, benefit from shared responsibility, up-to-date care plans, and broadened medical resources (Chiou et al., 2001a; Chiou et al., 2001b). The quality of Diabetes Shared Care is determined by both professionals and patients in coordination with their families, the health care system, and the community at large.

Problems with Diabetes Care in Taiwan

Even though these diabetes care programs outlined above have resulted in positive outcomes, profound problems still exist with respect to diabetes care in Taiwan. Eight problems associated with diabetes care in Taiwan can be identified from a review

of the literature, this investigator's experiences, and the pilot study (described in Chapter III) conducted prior to this principal study:

1. Inappropriate life-style and health-related habits of individuals

People who are overweight and live in urban areas have a higher prevalence of diabetes (Tai, 1996). Smoking, obesity, and lack of exercise are all risk factors for diabetes and its complications. These factors are heavily associated with patient lifestyle. Inappropriate life-style behaviors including smoking, drinking alcohol, and consuming a high protein diet have been also found to be especially prevalent among the aboriginal population of Hualien County. Adjustments in the life-styles of individuals with diabetes are especially important, therefore, for the prevention of complications.

2. Inappropriate perspective on health care utilization

The results of one study of diabetes health services utilization in Taiwan showed that only 54 % of diabetes patients consistently received health services (Tsai, 1999). And, not surprisingly, patients who had a regular source of health care had better outcomes. However, 30% of diabetes patients do not use a regular source of care (Tsai, 1999).

3. Problems associated with the quality of diabetes care programs

Some of the problems associated with diabetes education programs have already been discussed, including lack of family involvement. The insufficiency and inflexibility of education programs with respect to exercise, diet, and foot care have also received attention (C. C. Tseng, 1999). The occurrence of diabetic foot ulcers, for example, is more prevalent in Taiwan than in Japan. The results of Tseng's study (1999) showed that

more than 30% of diabetes patients with foot ulcers were unaware of the etiology of their problem. About 56% of patients discovered lesions only as a result of the pain associated with deterioration. Most of the patients dealt with the problem on their own and 35% of patients ignored the problem because they thought it was minor or because it was painless. Lack of awareness about foot care is a chronic problem and the need for better patient education concerning foot care is commonly ignored. The Taiwanese Association of Diabetes Educators (TADE), however, is currently developing the Diabetes Education Clinical Pathway (DOH Taiwan, 2001b). It is hoped that this program will provide comprehensive and flexible guidelines for diabetes education. In addition to diabetes health education, the rates of physician adherence to the diabetes treatment guidelines published by the DOH have been found to be very low. For example, only 15% of diabetes patients have had annual testing of A1C levels and only 7.7% have had annual eye check-ups (Lee, 2000), even though these services are covered under the fee-for-service payment system. In addition, in Lee's pilot study, based on a sample of diabetes patients documented by the National Health Insurance Bureau (NHIB) North Branch, the results of providers' profile analyses showed that diabetes treatment patterns varied between primary and tertiary levels of diabetes care agencies.

4. Lack of research related to diabetes care in especially vulnerable populations

Although women have a higher prevalence of diabetes than men, their special needs in this regard are generally ignored. Of special concern is the way in which the prevalence of diabetes in Hualien County's aboriginal township is increasing. The death rate resulting from diabetes in Hualien County is currently higher than that of Taiwan as

a whole (Hu, Hsih, Hung, Wu, & Yau, 1995; Huang & Chang, 2000). Huang and Chang (2000) interviewed key local informants with respect to perceived health problems and concerns in one aboriginal township of Hualien County in which the rate of death caused by diabetes was even higher than in other aboriginal townships. Sadly, none of these informants so much as mentioned diabetes care. Instead, they emphasized other health problems, such as alcoholism and accidents, which also had higher rates of incidence there than in other parts of the country. The problem of diabetes in Hualien County has been generally ignored and, therefore, is in special need of further investigation.

5. Lack of health services for high-risk populations

About 80% of nursing manpower in Taiwan is invested in hospital service systems (Chao, Chen, Yeh, & Tien, 2002). However, most patients with chronic illnesses are treated at small community health agencies. The prevention of diabetes and its complications depends heavily on community health promotion services. Therefore, inadequate manpower for health care is a serious in Taiwan.

6. Problems concerning accessibility to diabetes preventive care in remote areas

Access to diabetes care is a special problem for people who live in rural areas, especially for those who live in high mountain areas. Even though public health stations provide health services and case management for chronic diseases, including diabetes, the lack of manpower available to community services radically limits their success, especially in rural and mountain areas. In response, the DOH has designed a community intervention program with community health volunteers in order to provide diabetes patients with support from the community (DOH Taiwan, 2001a). While the

effectiveness of the program has not yet been demonstrated, it may be prove to be a viable alternative for better integrating community resources in the provision of diabetes care.

In response to the shortage of medical resources, one clinical trial focused on improvement of medical care in aboriginal townships was developed and conducted by a neighborhood hospital in Hualien County. And, this resulted in increased accessibility and utilization of medical care (Li, Yu, & Hsiangm, 2001). However, conflicts occurred between the hospital and local public health stations during the trial (Huang & Chang, 2000). The results of the program also failed to show mid- or long-term effectiveness of preventive care (Li et al., 2001). It seems clear, therefore, that effective interorganizational collaboration between hospitals and the community health care clinics is of critical importance for establishing successful diabetes care in remote areas.

7. Ineffective interdisciplinary professional care teams

The success of the patient-physician relationship has been found to be heavily correlated with patient adherence to a diabetes self-care regimen (Houng, 1994). However, the overcrowded conditions of diabetes clinics result in time constraints that do not allow adequate time for this relationship to be developed. In response to this problem, the DOH (2001b) developed the Health Education Clinic Trial in hospitals to encourage physicians to spend more time with their patients. However, the overcrowding in diabetes clinics has not improved because of the constraints imposed by the high level of patient demand to been seen in hospital subspecialty clinics. In addition to physicians, other health care providers, especially dietitians and nurses, can also provide diabetes health

education, but these services generally have not been available in clinics. Thus, in order to adequately meet patient needs, a greater availability of interdisciplinary health care teams is called for, especially with respect to addressing the need for diabetes education. Unfortunately, however, national health insurance does not cover patient education.

8. Needs to improve inter-organizational collaboration in the Shared Care system

Even though several studies have shown an improvement in cost control and quality of care as a result of utilizing the Shared Care Model, the continuity of care of patients who are discharged from the hospital remains unsatisfactory (Ho, 2001; Lu, 2001). On the basis of an evaluation of studies of the Diabetes Shared Care Model, there is a chronic lack of consensus between health care providers, especially when it comes to following diabetes management guidelines (T. L. Chen et al., 2001; Lee, 2000). Clearly, therefore, there is still ample room for improvement in the referral system and the general quality of diabetes care. The development of greater consensus and coordination among the various disciplines involved and the various organizations in question is clearly called for.

In summary, lack of adequate patient education and collaboration among interdisciplinary professionals and organizations are major problems with respect to health care utilization in Taiwan and diabetes care in particular. While the DOH is striving to improve the quality of diabetes care in order to resolve this massive public health problem, still, there is an urgent need to foster greater and more efficient collaboration between disciplines and organizations.

The Health Care System and Unique Problems in Hualien

This study has been conducted in Hualien County, which has not heretofore been the subject of an evaluation in terms of diabetes care. The unique problems of diabetes care in Hualien County include the presence of large numbers of aboriginal people, special economic problems, transportation problems in high mountain areas, and inadequate medical facilities and manpower to insure patient access to diabetes care. Hualien County is a geographically long and narrow county, with a population of 353.6 thousand, located in eastern Taiwan. One-fourth of the population is aboriginal or native Taiwanese. The lifestyle of aborigines differs from that of other inhabitants. There are 11 hospitals, 13 public health stations with clinics, and 277 private primary care clinics in Hualien County. According to health statistics from Taiwan's DOH (2000), there are a total of 583 physicians, 1996 nurses, and 22 dietitians serving the whole county, but there are only 41 physicians with a specialty in internal medicine, only 19 physicians with a specialty in family medicine, and only four physicians are diabetologists. Most hospitals and clinics are concentrated in Hualien City, located in northern Hualien County. An acute lack of medical resources is especially common in remote areas inhabited mostly by aborigines.

There are more than eight thousand patients with diabetes in Hualien County. However, only four endocrinologists practice in this county. Two of them serve in the medical center, one in a regional hospital, and the other works in his own clinics. Most diabetes care is provided by public and private primary-care clinics. There are only two hospital-based diabetes health education centers and one diabetes education clinic in

another hospital that are certificated by TADE. The Hualien County Bureau of Health, NHIB Eastern Branch (NHIB-EB), hospitals that have diabetes specialists, and Hualien Medical Association are working together to integrate health care resources in the development of a shared care system for diabetes care delivery.

The Diabetes Shared care System was introduced to Taiwan beginning in 1996. According to the testimony of a diabetologist who works in the medical center, however, only one primary clinic has as yet decided to participate in the Diabetes Shared Care System. Most of the primary care physicians have refused to join because of the complicated documentation involved and the feeling that their professional autonomy is violated by the Diabetes Shared Care System. According to the results of the pilot study, most physicians in private primary clinics have been worried that the referral system may serve to transfer their patients from their clinics to hospitals. Lack of communication is another problem. In addition, most private primary clinics do not have sufficient manpower for diabetes education programs. In addition, the lack of attention paid to diabetes care in Hualien County, generally speaking, makes it very difficult to make significant progress in this direction.

Statement of the Problem

There is a serious lack of studies about quality of diabetes care and a need to identify organizational and patient factors that influence the quality of diabetes care in Hualien County, Taiwan.

Significance

This study provides health care professionals with a better understanding of the quality of diabetes care in Hualien. This is particularly important due to the paucity of studies related to diabetes care in eastern Taiwan. Furthermore, the study may provide evidence for the hypothesis that self-care behavior could serve as an intermediate outcome indicator for evaluating the quality of diabetes care. Finally, the results of this study will provide health care administers with useful information for improving the quality of diabetes care in Hualien County, Taiwan.

Research Questions

1. What are the patient outcomes (glycemic control, patient adherence to self-care, and perception of quality of life) of diabetes care received in the previous year?
2. What levels of diabetes preventive care have people with diabetes received in the previous year?
3. What are the relative contributions of patient and organizational factors in terms of patient gender, age, education, ethnicity, employment, marital status, length of time since diagnosis, and pattern of diabetes treatment, institution characteristics, physician specialty, professional-patient relationships, facilitation of professional-patient relationship, organizational collaboration, preventive monitoring, and education care to patient outcomes of diabetes care, patient adherence to self-care regimen, perception of quality of life, and glycemic control, respectively, in Hualien, Taiwan?

Framework

Donabedian's (1982) structure-process-outcome framework has been applied extensively in quality improvement within health care delivery systems, especially in hospital and ambulatory care settings. It is also feasible to apply the framework to a larger-scale health care system that includes the community at large.

In Donabedian's framework (1982), structure and process refer to the organization of the health care system through which health care is delivered. "Structure" refers to the resources used in the provision of care. "Process" refers to the activities that constitute care. "Outcomes" are the health consequences that result from the process. Structure has a direct influence on the process of care. Outcomes depend on what was provided in the process of care. Structure and process must be modified in accordance with the extent to which outcomes are successful. These three criteria are closely interrelated and need to be monitored continuously and improved in order to achieve the highest quality of care possible. Professionals and resources are integrated into the process of the delivery of care in accordance with the nature of the organization of the health care system, and this organization of the health care system has a direct influence on patient outcomes of care. The health care system is capable of continuously improving the quality of care through the development of technology that serves to more adequately assess, measure, and monitor care (Wilson, 1991). Subsequently, on the basis of the outcomes of care, health care system analysts can evaluate and modify the organization of the system to improve these outcomes.

Aday indicated that structure, process, and outcomes of care can be studied at a system level or patient level of analysis (Aday, Begley, Lairson, & Slater, 1998). Donabedian (1982; 1995a) indicated that process of care included technical care and interpersonal care. In diabetes care, technical care can refer to preventive monitoring and education that are provided to prevent complications and to improve system and patient level outcomes. Interpersonal care refers to patient-professional relationships. Through integrated organizational structure and processes, a health care system provides the environment in which health professionals can enhance technical and interpersonal care.

A framework of quality of diabetes care that has been synthesized by the investigator for the purposes of this dissertation study is depicted in figure 1. Diabetes is a highly complicated disease that requires a great deal of care and well-coordinated collaboration among multiple disciplines, between patient and health care professionals, and between the health care system and community health care resources and social support. Metabolic control prevents patients from developing diabetes complications. Patients with diabetes are expected to adhere to diabetes self-care regimens in order to maintain metabolic control. The organization of the health care system links patient, health care professionals, and community resources and social support. Given accessibility to health care services and the establishment of patient-provider relationships through organization of the health care system, patient diabetes-related knowledge and patient adherence to self-care regimen may be facilitated and the outcomes of care greatly improved. Successful outcomes of care are expected to enhance glycemic control and patient quality of life, decreasing diabetes complications.

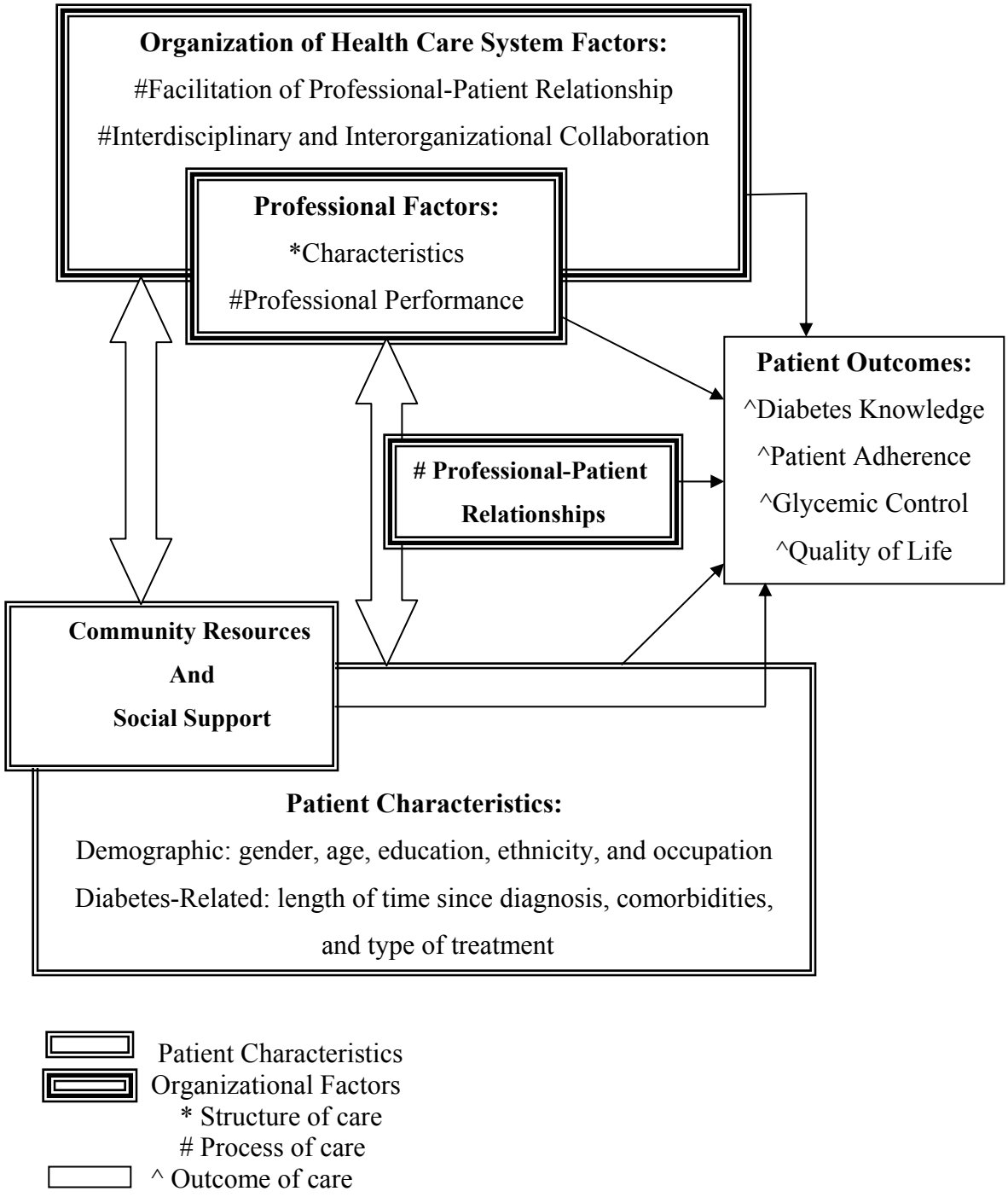


Figure 1. Framework of Quality of Diabetes Care (Chang, 2002)

Description of Major Concepts

Organization of the Health Care System

The organization of the health care system refers to the design of the process that integrates resources and health care system professionals in the provision of care. Organization of the health care system provides an environment for interpersonal care and facilitates professional-patient relationships. It also bridges the collaboration among health care disciplines within the system, and between the system and other health care systems in the patient's community. Patients receive the most benefits from care that is delivered by a well-organized health care system. Organization can be viewed as the system's policies and procedures with which health care professionals provide their best care to patients. A referral system that provides patients easy access to health care in their communities is essential for continuity of diabetes care. Thus, facilitation of patient-professional relationships and interdisciplinary and interorganizational collaboration configure the organization of the health care system for optimum delivery of diabetes care.

Facilitation of professional-patient relationships

Arrangement of the process of care in such a way as to be convenient for patients, a decrease of the waiting time in clinics, and the prolongation of consulting time during visits provides an opportunity for developing and maintaining patient-physician relationships. The diabetes mellitus passport, facilitating the sharing of information, can also help to improve the quality of professional-patient relationships. In this study, the duration of physician-patient clinic consultations, advance assignment of appointments,

and use of the diabetes mellitus passport will be used to assess the levels of facilitation of professional-patient relationships.

Interdisciplinary and interorganizational collaboration

The collaborative model, providing patients with interdisciplinary care, includes vertical and horizontal levels of integration. The former focuses on the continuity of care, the latter includes the alliance of multiple disciplines and management. Both are of instrumental importance for enhancing access to care. Collaboration is a dynamic, transformative process resulting in a power-sharing partnership for the pervasive application of health care practices education, and research in diverse organizational settings. Collaboration fosters purposeful attention to needs and problems in order to achieve successful outcomes (Sullivan, 1998).

Miller, Freeman, and Ross (2001) have suggested that collaboration is one of the multidimensional natures of teamwork (p. 27). However, precise measurement of the effectiveness of teamwork is quite difficult (Miller, Freeman, & Ross, 2001, p. 24). Studies have demonstrated that collaboration can be implemented in different settings, through the employment of different combinations of professionals, and through different procedural designs (Brita-Rossi et al., 1996).

The advantages of collaboration have been supported by many studies (Baggs et al., 1997; Quinn et al., 2001; Wickizer, Franklin, Plaeger-Brockway, & Mootz, 2001). Not only does collaboration improve healthcare quality, it also enhances the satisfaction of healthcare providers and patients alike (Baggs et al., 1997).

1. *Collaboration among multiple disciplines.*

Diabetes care requires a collaborative, interdisciplinary care team. The American Nurses Association (ANA) and the Institute of Medicine (IOM) have reported that health care systems need to improve quality of care through the ongoing development of multidisciplinary approaches for patients with diabetes (AMA, JCAHO, & NCQA Release Common Measures for Diabetes, 2001). Multidisciplinary collaboration can provide comprehensive care for diabetes. Platt (1994) indicated that successful collaboration requires that team members share information with each other that is relevant to an evaluation of the patient's progress. Thus sharing is essential for maintaining continuity. Interdisciplinary collaboration broadens patients' access to diabetes education services when it is impossible for the physician alone to provide preventive diabetes education in overcrowded clinics.

2. *Collaboration between the health care system and the patient's community.*

The successful maintenance of diabetes control requires continuity of care that extends beyond the hospital setting. In other words, diabetes care needs to include the entire process of care both in and out of the hospital. Quinn and associates (2001), for example, developed a collaborative care model between primary care physicians (PCPs) in outpatient clinics and endocrinologists to create an environment of trust and collaboration and to improve the care of patients with diabetes. The results indicated a high level of satisfaction with the collaborative model among both patients and PCPs. Mean glycosylated hemoglobin levels of the patients enrolled in the program were also found to be reduced (Quinn et al., 2001). A referral system can serve as a bridge between

the hospital and community health care providers, serving to enhance continuity of care and the patient's access to that care.

The number of referrals for diabetes treatment to other disciplines or other health care systems, which patients received from the physician they usually visit, and the number of phone calls or home visits regarding diabetes counseling that they received will be used to measure collaboration in this study.

Patient Characteristics

Patient characteristics include demographic characteristics (gender, age, education, ethnicity, and occupation status) and diabetes-related characteristics (length of time since diagnosis, comorbidities, and type of treatment). Studies have shown that patient demographic and diabetes-related characteristics can influence patient knowledge about diabetes and self-management and subsequently influence the extent of diabetes control and quality of life.

Community health and social support

Diabetes is a life-long, chronic illness. Not only is diabetes a bio-physiological problem, it also has a psychosocial impact on patients. Characteristics of chronic care include continuous and anticipated needs that depend on both a holistic patient care approach and care management (Phillips-Harris, 1998). Individuals with a chronic illness cannot adequately be managed by clinical interventions alone. Adequate levels of social support are intimately related to successful health promotion behaviors (Glasgow, Strycker, Toobert, & Eakin, 2000; Glasgow et al., 1989) and enhanced community resources are essential for especially vulnerable populations that have special needs in

terms of peer support and long-term care (Glasgow, Orleans, & Wagner, 2001). As a result of the low socio-economic status of many residents of Hualien, the health care system has a special responsibility to expend greater levels of resources that can be integrated into diabetes care in this community. Diabetes-related social support can be measured by using patient perceptions of social support from their family, neighbors, friends, or colleagues.

Professional-Patient Relationships

Donabedian (1982; 1995a) divided the processes of care into technical care and the management of the interpersonal process between professional and client . Interpersonal care is one of the components of process of care. The relationship with health care providers is one of the major social factors and elements of concern of diabetes patients (Glasgow et al., 2000). Lo (1998) discovered that the factor that most influenced patient adherence was the quality of the relationship between health providers and the client. Physician-patient relationship has been found to be associated with patient adherence to a self-care regimen (Houng, 1994). Insufficiency or deficiency of communication between the patient and the health care professional can cause problems in their relationships (Helseth, Susman, Crabtree, & O'Connor, 1999; Swinney, 1988). Professional-patient relationships should be characterized by a high level of communication, equality in care regimen decision-making, and mutual respect between patients and physicians. Through cooperation between patient and physician, a reciprocal relationship of mutual trust can be developed with shared goals, mutual respect, and shared decision-making. In this study, quality of professional-patient relationships will be

assessed in terms of patient satisfaction with the professionals, including physicians, nurses and/or dietitians, from whom patients have received care.

Professional Factors

Professional factors include professional characteristics and professional performance.

Professional characteristics

Professional characteristics, such as a physician's subspecialty (Garay-Sevilla, Malacara, Gonzalez-Parada, & Jordan-Gines, 1998) , whether or not he or she has been certified by diabetes-related professional organizations, and the resources of the health care system in which he or she practices, such as qualified nurses or other professionals cooperatively working as a team, may have a profound effect on professional performance and subsequent patient outcomes.

Professional performance

Professional performance is defined as the degree of professional adherence to the criteria of care (Donabedian, 1980). According to Donabedian's framework (1982; 1995a), technical care is a component of the process of care and is reflected in professional performance. Technical performance depends on the level of the professional's knowledge and his or her exercise of good judgment with respect to strategies for appropriate care (Donabedian, 1995a). Donabedian (1985) pointed out that these judgments are based on future expectations, but are limited to the concurrent knowledge. Professional performance refers to the level and quality of care provided to patients with diabetes. Provision of diabetes preventive care, including preventive

monitoring and diabetes education recommended by the ADA ("AMA JCAHO and NCQA", 2001; 2002) can be used as an indicator for evaluating the professional performance of diabetes care providers. Diabetes preventive monitoring includes examinations and blood tests related to risk factors of complications in terms of A1C, blood glucose, foot examination, nephropathy assessment, lipid profile, blood pressure, and ophthalmoscopic examination (Bouldin et al., 2002; Petitti et al., 2000). Diabetes education must include instructing patients about self-care, including diet, exercise, foot care, self-monitoring of blood glucose, and tobacco use and counseling.

Patient Outcomes

Donabedian (1982)indicated that outcomes of health care related to its quality should include patients' physical, physiological, psychological, and social health. Outcomes are also related to patients' knowledge, attitudes, and behaviors about health, to the extent that these results from prior care and contribute to current or future health. Outcome is one of the primary factors used to evaluate the quality of care, although healthcare quality can be measured in several different ways. The benefits sought by consumers from the healthcare system are the maximization of their health status and the minimization of their financial risk related to illness (Yang et al., 2001). Thus, health status can be used as an outcome of quality of healthcare services. Health status can be measured with subjective and objective data related to both physical and psychosocial health, which represent or reflect biomedical outcomes and quality of life, respectively. Biomedical outcomes include metabolic control (markers of risk factors of diabetes

complications such as A1C, cholesterol, triglyceride, and microalbuminuria) and the presence of diabetes complications.

Levels of adherence and self-care activities have been found to be associated with improvements in metabolic control, physical health, and well-being (Auslander, Thompson, Dreitzer, White, & Santiago, 1997; Bond, Aiken, & Somerville, 1992; Hanson, Henggeler, & Burghen, 1987; Lloyd, Wing, Orchard, & Becker, 1993; Miyoshi, 1999; Tu & Morrison, 1996), and thus may prevent severe complications (Kamel et al., 2000; Philis-Tsimikas & Walker, 2001). Therefore, patient adherence, glycemic control, and perceived quality of life will be used to measure outcomes of quality of diabetes care in Hualien County.

Patient outcomes: knowledge

Prevention of diabetes complications relies very heavily on diabetes self-care. People with diabetes need to have adequate knowledge about their condition so that they can adhere to the self-care regimen recommended by professionals. Diabetes knowledge includes knowledge about the disease itself, treatment, complications, and self-care activities.

Patient outcomes: patient adherence

Control of diabetes relies on patient self-care so as to enhance metabolic control and prevent diabetes complications. Adherence requires that the patient abide by a self-care regimen that is perceived to be the best fit for his or her lifestyle. Adherence to a self-care regimen is an active, individual, dynamic, and continuous process. Components of diabetes self-management include diet control, regular medication, self-monitoring of

blood glucose, exercise, foot care, and smoking cessation. Adherence is usually measured in terms of observation or self-reporting of these self-care activities (Toobert, Hampson, & Glasgow, 2000).

Patient outcomes: glycemic control

One of the outcome indicators of diabetic control is the level of glycosylated hemoglobin (A1C), which refers to a series of hemoglobin components formed by the addition of glucose to normal adult hemoglobin. A1C reflects mean plasma glucose concentrations over 6-8 weeks that approximates the half-life of the red cell; this has become the gold standard in the assessment of diabetes control. Levels of around 6% are seen as acceptable, and the patient should strive to maintain levels of less than 7% (Scobie, 2002).

Patient outcomes: quality of life

For the purposes of this study, quality of life is seen as composed of four domains: physical health, psychological aspects, social relationships, and the environment. Various questionnaires have been developed to measure quality of life. In this study, the WHOQOL-BREF Taiwan version will be used as the measure for quality of life. The description of concepts, variables, and measures used in this study are listed in Chapter III, Table 3.5 and Table 3.6.

Theoretical Explanations

Patient Characteristics Contribute to Outcomes of Diabetes Care

People with diabetes are expected to self-manage their diabetes by following a care regimen designed to maintain or improve their metabolic control, thereby preventing diabetes complications. Studies conducted in the United States have shown various associations between demographic factors and adherence to a care regimen (see Chapter II). Minority groups, on average, have lower levels of education, lower incomes, and often have communication barriers as a result of English being a second or foreign language. These demographic characteristics make adherence to a diabetes care regimen even more difficult and complicated. A similar condition also exists in Hualien, Taiwan. Women and men have a different prevalence of diabetes complications (James, Hughes, Mills, & Westerband, 2001). Adherence has been also found to differ between men and women. In addition, patients in Hualien were found, in the investigator's pilot study (see Chapter III), to tend to have unstable work schedules and locations. Therefore, the demographic factors include in this study will include gender, education, ethnicity, and occupational status.

Disease-related factors have been found to be associated with patient adherence. Disease-related factors include type and severity of illness and length of time since diagnosis. Schoenberg, Amey, and Coward (1998) indicated that the disease type (including type 1 or type 2 diabetes) was more strongly related to dietary adherence than demographic factors. Insufficiently intensive therapy for diabetes control is a significant barrier to adherence to self-monitoring of blood glucose (Karter et al., 2000). In addition,

lack of symptoms also contribute to the existence of barriers to dietary adherence (Williamson, Hunt, Pope, & Tolman, 2000). Obviously, severity of illness can influence patients' adherence. Severity of diabetes can be assessed in terms of diabetes-related comorbidities. Karter et al. (2000) found that longer time since diagnosis is a barrier for adherence. Adherence to diet was found positively associated with years since diagnosis (Garay-Sevilla et al. 1998).

Social Support Contribute to Patient Outcomes

Social support has been shown to be positively related to health behaviors (Glasgow et al., 2000; Glasgow et al., 1989; McCaul, Glasgow, & Schafer, 1987). Family support can influence the success of patients' adherence to medical regimens (MacLean & Lo, 1998). Social support beyond the family is a valuable resource as well. Older diabetes patients expect support from their families. Additionally, patient perception of emotional support from the family was found to be low in studies of diabetes adherence in Taiwan. It is common for young families from Hualien County to live and work outside of the county. Older diabetes patients, therefore, may have problems receiving social support for their diabetes care. Whether people with diabetes in Hualien County have adequate social support and the extent to which this has an impact on diabetes care outcomes needs further investigation.

Patient-Professional Relationship Contributes to Patient Outcomes.

Lo (1998) discovered that the most important factor influencing adherence is the quality of the relationship between health providers and the client. Doctor-patient communication is highly correlated with successful diabetes self-care behavior (Huka,

Kupper, Cassel, & Mayo, 1975). Cooperation in the patient-doctor dyad was found to be heavily associated with adherence (MacElveen, Alexander, & Hoover, 1975). Patient satisfaction with the physician-patient interaction clearly serves to facilitate continuity of care and patient adherence to a self-care regimen.

Professional Factors Contribute to Patient Outcomes

Studies have shown that professional characteristics influence the outcomes of diabetes care (Garay-Sevilla et al., 1998). Physician attributes and practice styles have also been shown to contribute to patients' adherence to treatment (DiMatteo et al., 1993). Other characteristics, such as professional specialty, certification by a professional diabetes care organization, and updated knowledge of diabetes research are essential for health care providers to provide optimal diabetes care. In addition, professional performance that adheres to diabetes care guidelines can also facilitate patient awareness of their disease and, in turn, positively influence patient adherence, resulting in better glycemic control.

The Configuration of Organization of the Health Care System Contributes to Patient Outcomes

Patient adherence to a self-care regimen can be motivated by optimal levels of social support by health care providers. The health care system and its professionals need to provide an integrated health care environment through advanced organization of the health care system, so as to provide optimal diabetes care and enhance patient adherence.

Facilitation of professional-patient relationship contribute to patient outcomes

Studies have shown that several factors, such as the number of patients seen per week and the scheduling of follow-up appointments, are positively associated with patient adherence (Gibson, 1979). Early detection, linkage to a source of care by referrals and the scheduling of appointments, clinical education through physician-patient encounters, and timely appointment keeping, all contribute to the successful initiation and maintenance of a self-care regimen. In addition, the enhancement of professional-patient relationships that serve to improve patient adherence to a self-care regimen can subsequently improve care outcomes.

Interdisciplinary and interorganizational collaboration contributes to patient outcomes

Studies have shown that interventions with interdisciplinary collaboration in diabetes care programs improve patient outcomes (Brunt, Johnson, & Lindsay, 2000). Since diabetes control relies heavily on patient self-management in their day-to-day life, continuity of care beyond the hospital is needed. Community resources such as family, workplace, and neighborhood health care agencies can support continuity of care. Collaboration between the health care system, other community resources, and general social support systems contribute to patient access to care and continuity of care and subsequently improves patient adherence and care outcomes.

Patient Knowledge, Patient Adherence, Glycemic Control and Quality of Life are Intercorrelated Outcomes of Diabetes Care

Due to the complexity of diabetes-related knowledge, patients need intensive education and careful monitoring to improve their knowledge concerning their illness. Hendricks, Hendricks, and Young (1999) suggested that if patients have more information about their disease and accurately perceive their condition as requiring diabetes control, they will be more likely to adhere to a self-care regimen. Patient adherence to self-care regimen improves metabolic control and decreases or delays the occurrence of diabetes complications, enhancing health status and quality of life.

Quality of life is measured with multiple domains including physical, psychological, social relations, and environmental aspects. Basa and Mcleod (1995) have also suggested that improvement in quality of life should be one of the primary goals of diabetes education programs.

Summary

Patient adherence can be a mediator of outcomes of diabetes care. Patients need to be empowered by health care providers in order to successfully adhere to a self-care regimen. Therefore, effective collaboration between patient and physician is of critical importance for patient adherence. Other factors, including patient characteristics and the quality of care as perceived by the patient reflect the quality of the organization of the health care system, and have an impact on patient self-care. In Hualien, Taiwan, a patient's access to diabetes care may be a desperate problem, as a result of geographic disparities in the allocation of services. Hence, interdisciplinary and interorganizational

collaboration is especially important in this area, in order to guarantee the integrity of the health care system, which depends upon an egalitarian distribution of community resources. Collaboration enhances diabetes patients' access to and continuity of care, and subsequently facilitates patients' knowledge, adherence to their self-care regimens, glycemic control and quality of life.

Assumptions of the Study

1. Humans interact with the environment in which they live.
   a. One's behavior is heavily influenced by one's environment.
   b. The health care system is one component of the environment affecting health.
2. Integration of environmental resources results in a product that is greater than the sum of its parts. Therefore, collaboration should produce interventions that are superior to unitary or isolated interventions.
3. The quality of diabetes care can be validly measured by study methods.
4. The quality of care can be viewed from a structure-process-outcome perspective.
5. Structure, process, and outcome can be validly and reliably measured by study instruments.
6. The quality of diabetes care relies on the involvement of multiple disciplines.
7. The health care system in Hualien can be evaluated through patient report and medical record review.

Limitations of the study

The limitations of this study have been identified as follows:

1. This study is a cross-sectional study that provides only a snapshot view of the reality in question, obtained at the time of data collection. The results have failed to demonstrate either sequential or causal relationships.
2. Even though the sample was randomly selected, data were collected according to participant willingness. The results, therefore, can be seen, with some due caution, as generalizable for all of the diabetes population in Hualien County.
3. The data reflected only patient perceptions of the health care system, and did not include other perspectives or take into account various other important professional factors such as the quality of diabetes education provided.
4. Data were collected from both patient self-reported questionnaires and reviews of medical records. The former might have some limitations related to human factors such as memory, interpretation, and social desirability; the latter might be limited due to incomplete records.
5. Participant levels of A1C were collected on the basis of the last test to be administered prior to responding to the questionnaires. Not all physicians regularly prescribe tests of the A1C level for their patients. Thus, some participants' A1C levels were not up to date. Therefore, the results related to A1C level may not have reflected concurrent relationships between A1C and other study variables.
6. Measurement of certain key concepts was limited to the data available to address those concepts (for example A1C level).

CHAPTER II

REVIEW OF LITERATURE

Introduction

The literature review for this study focuses on (a) the concept of quality of care; (b) diabetes care programs and outcomes; (c) patient characteristics and provider-patient relationships related to diabetes patient adherence to self-care regimens; and (d) methods to measure structure, process and outcomes of quality of diabetes care.

Concept of Quality of Care

For some time, health care providers and administrators in developed countries have been pursuing programs of optimal care for diabetes control and the prevention of its complications. In order to determine what are the most effective and efficient programs, one must thoroughly evaluate the quality of care programs and investigate the factors that influence the quality of that care.

Quality of care can be viewed from three central perspectives: that of the administrator of the delivery system, that of the health care provider, and that of the patient/client who receives health care (Donabedian, 1980). Most importantly, perceptions of quality depend, in part, on the values held by each individual in question. Individuals in different situations, with different needs and challenges, hold different values. People also differ in their judgments concerning priorities of treatment (Donabedian, 1980). Hence, quality of care varies according to the unique needs and perspectives of each person making an assessment of quality of care.

Criteria for quality are the factors that one measures in order to assess the quality of care (Donabedian, 1982). Donabedian's framework provides a set of criteria to assess quality of care based on the extent to which that care contributes to successful outcomes (Donabedian, 1982). These criteria are related to structure, process, and outcome, or some combination of the three (Donabedian, 1982). The quality of a care program depends on how the program was designed, implemented, and evaluated, again, in terms of structure, process, and outcome.

Process of Care

Donabedian (1982) developed his initial conceptual framework concerning the process of health care by analyzing studies dealing with clients' views of quality. He distinguished between the process of technical care and the management of the interpersonal process between practitioner and client (Donabedian, 1982, 1995a). Technical care is related to the medical professional's knowledge and skill, which make the delivery of successful care possible. The interpersonal process is the vehicle by which technical care is successfully implemented. Donabedian (1982) provided methods for assessing the process of care, which include a review of records, observation of practice, and use of explicit and implicit criteria in judging the quality of care.

In addition to technical performance, Donabedian (1980) also included the component of interpersonal performance. In Sanazaro and Williamson's study, management of the interpersonal relationship was conceptualized as including professional responsibility, professional manner, psychological perception, psychological support, and patient education (Donabedian, 1980). The interpersonal relationship

between patient and professionals is difficult to assess, however, and standardized care guideline usually do not address patient-professional interpersonal processes. Donabedian (1995a) indicated that management of the interpersonal process is still poorly understood.

Naturally, the quality of the process of care depends upon the quality of the services provided by health care professionals. It is the process of care that determines the success or failure of the outcome (Young, Parker, & Charns, 2001). This includes documentation of the process of health care delivery, the adequacy of medical record keeping, patient satisfaction, the number and quality of laboratory tests performed, and the length of the patient waiting period in clinical settings (Oberklaid, Barnett, Jarman, & Sewell, 1991). Pierce (1997) indicated that key measures of the quality of the process of care, according to the Institute of Medicine (IOM), include assessment approaches, care planning, and care implementation (including physical care, counseling, education, and documentation of the care given).

Outcomes of Care

Donabedian (1982) suggested that the quality of health care outcomes depends upon, and should be driven by, the patient's unique physical, physiological, psychological, and social health. Successful outcomes build upon the gains made as a result of prior care, which contribute to the current and future health of the patient (Donabedian, 1982). Thus, outcomes can be related to patients' knowledge, attitudes, and health maintenance behaviors. Patient satisfaction is also one such outcome. Donabedian (1982) also suggests that the satisfaction of the care provider may contribute to high quality, professional performance.

Diabetes Care Programs and Outcomes

Management of patients' outcomes has become a common method of evaluation of care programs. Peeples, Mulcahy, Tomky, and Weaver (2001) indicated that the improvement of care quality depends on the development of program services, monitoring, implementation, and resource management. The goal of outcome management is to improve quality of care and constrain costs (Scroggins, Thornton, & Neumann, 1999).

Outcomes Management

Traditional outcomes management has tended to focus primarily on physiologic outcomes. Most recently, patients' perspectives of their day-to-day functioning and well-being have been emphasized (Lorig et al., 1996). One of the other trends of outcomes management is a change from an acute-care individual approach to a chronic-care population-based approach, which is likely to be more effective and efficient than the conventional approach (Cohen, Scribner, & Farley, 2000; Glasgow, 1999). The traditional acute-care approach focuses on patients' internal physiological environments and pharmacological interventions. A population-based approach, on the other hand, focuses on external social environments, self-management interventions, and it is implemented through the collaboration of patients and health care teams (Glasgow, Wagner et al., 1999).

A disease management approach (Cohen et al., 2000; Glasgow, Wagner et al., 1999; Grundel, White, & Eichold, 1999; McCulloch, Price, Hindmarsh, & Wagner, 1998; Scroggins et al., 1999; Wagner, Glasgow et al., 2001) includes similar concepts:

providing the best contemporary forms of continuity of care through coordination of patient resources, standardized management, tracking tools, and structured care methodologies as they have evolved through interdisciplinary collaboration (Scroggins et al., 1999). Bellen (1994) indicated that consumer-oriented outcomes management produces the desired result of increasing both customer satisfaction and economic viability. Researchers have attempted, therefore, to improve care programs through the management of patient outcomes and the processes that influence those outcomes.

Diabetes Care Programs

Diabetes care programs include maintenance of diabetes control and prevention of its complications. Diabetes control is affected by patient adherence to a self-care regimen in his/her daily-life activities. Brown (1999) reviewed the literature on diabetes patient education and suggested that diabetes intervention has developed from 'education only' to 'education plus behavioral models'. The social context accounts for much of the environment that influences individual health behaviors (Samuel-Hodge et al., 2000). Diabetes self-management calls for behavioral changes on the part of the patient, including changes in interpersonal interaction and interaction between personal and social environments (Glasgow, Fisher et al., 1999; Glasgow et al., 2000). Glasgow et al.(2000) Glasgow et al. emphasized the importance of taking the ecological context of patients into consideration when designing and administering interventions.

There is a recent trend for diabetes programs in the U.S. to be integrated into disease management and case management. Norris et al. (2002) reviewed the literature about disease management and case management for diabetes control. These researchers

reported evidence of the effectiveness of preventive monitoring and disease management, including monitoring of glycemic control, retinopathy, nephropathy, foot lesions and peripheral neuropathy, proteinuria, and lipid profile monitoring. Case management was also found to be effective in improving both glycemic control and the monitoring of glycemic control, when providing care in conjunction with disease management. Case management should also include the increased provision of diabetes education, reminders about self-care activities, and supportive interventions (Norris et al., 2002).

Organizational Factors

Organizational factors exert an influence on patient adherence to self-care regimen. Gibson (1979) indicated that the waiting time at clinics, the method of clinic visit scheduling, and levels of clinical supervision were associated with patient adherence. The specific features of the prescribed care regimen could also influence adherence (DiMatteo et al., 1993; Pawlicki, 1980). Garay-Sevilla, Malacara, Gonzalez-Parada, and Jordan-Gines (1998) investigated the role of belief in the practice of conventional medicine, various types of medical care, and the role of family and socioeconomic factors on adherence to treatment programs for 156 patients with type 2 diabetes mellitus. The results showed that patients under the care of a diabetes specialist had better adherence to diet and medication regimens.

In another study of medical outcomes that examined 186 physicians and their patients who suffered from diabetes, hypertension, and heart disease, physician characteristics were found to be associated with patient adherence to diet and medication regimens (DiMatteo et al., 1993). These characteristics included physician job

satisfaction, number of patients seen per week, scheduling of follow-up appointments, tendency to answer patient questions, number of tests ordered, and physician specialty. Hendricks et al. (1999) concluded, on the basis of the Diabetes Day Treatment Experiment, that providing patients with a blood sugar test, a blood pressure check-up, and weighing them during each visit could promote patient adherence to the diabetes treatment regimen. Haynes, Taylor, and Sackett (1979) pointed out that the referral process also had an impact on levels of patient adherence. Furthermore, physician referral behavior was also found to be affected by physician characteristics, including their medical training and clinical experiences, age, gender, and level of tolerance of clinical uncertainty (Reid, 1998).

Greenfield and associates (1995) compared the medical outcomes of patients with type 2 diabetes treated by different health care systems and specialties. The principal providers were family practitioners, general internists, cardiologists, or endocrinologists. The results did not yield any evidence of superior outcomes of care, including glycosylated hemoglobin level and yearly mortality rate, on the basis of any physician specialty. However, endocrinologists did achieve better results for patients with type 2 diabetes, with respect to foot-ulcer and infection outcomes, than did general practitioners or physicians with other specialties. All of the factors mentioned above are related to the elements of structure and process in Donabedian's framework.

Process: professional performance

Donabedian (1980) examined a series of studies in order to develop a critical focus on the definition of quality of care and its assessment. In two of these studies, the

process of care was described in terms of professional performance. In Sanazaro and Williamson's study, for example, 2,500 internists were asked to describe three examples of effective care and three examples of ineffective care that had occurred over the course of the preceding year. Traditional procedures (subsequently referred to as "technical care") accounted for approximately 70% of the examples of care that were cited, while about 20% of the care procedures cited involved interpersonal process, and 10% access, coordination, and continuity of care. The categories of care giving involved included access, continuity, and coordination, use of a health care team, use of community resources, and a review of problems and follow-up treatment.

In the other study (Donabedian, 1980) analyzed the records of care provided to a sample of 805 families in terms of prevention, continuity, and rationality, which explained 42% of the variance among the cases with respect to the most important elements of care. Follow-up visits requested and follow-up visits that took place represent aspects of continuity of care. Prevention and rationality came under the category of technical care. Prevention accounted for the highest proportion of variance, 17.5%. Several factors may have an influence on preventive performance.

In another survey of 120 randomly selected primary physicians in New York City, for example, 87% agreed that physicians should practice more preventive medicine (Green & Kreuter, 1991). These physicians cited lack of time as one of the main obstacles to practicing preventive care and suggested that the practice of preventive care was more feasible if physicians used computer-prompted reminders. A lack of skill in the practice of preventive care was also cited as one of the barriers to the implementation of

preventive services. Clearly, therefore, professional education needs to be enhanced in such a way as to increase competence in the area of preventive medicine.

Process: interpersonal relationships

Management of interpersonal relationships account for about 20% of the care-giving process (Donabedian, 1980). Interpersonal interaction is the vehicle by which technical care is successfully implemented (Donabedian, 1982, 1995a). Information concerning interpersonal processes in the practice of medicine is not easily available, however, due to the complexity of the subject and the lack of general guidelines. According to Donabedian (1995a): "Management of the interpersonal process is still poorly understood." Management of the interpersonal relationship includes professional responsibility, professional manner, psychological perception, psychological support, and patient education (Donabedian, 1980).

Donabedian's framework of quality of care can also be applied to the issue of patient adherence. Gibson (1979) suggested that health care organizations need to provide long-term follow-up services to enhance adherence, because: "Small changes can greatly enhance over all efficiency in dealing with common problems." Health care organizations have utilized various care models for diabetes patients. A case management model has been applied in diabetes care, that has facilitated self-management on the part of the patient and their family (Caravalho & Saylor, 2000). Diverse programs, including support groups and camps for diabetic patients, have also been provided by some health care organizations (Smith, Schreiner, Jackson, & Travis, 1993).

Gibson (1979) has suggested several organizational steps for the effective management of adherence problems. These steps include detection, linkage to a source of care by referrals and scheduling appointments, clinical education through physician-patient encounters and appointment keeping, and initiation of a regimen. Sackett (1979) recommended some helpful adherence improvement strategies including increased attention and supervision, modification of the regimen, and referrals for assistance (Pawlicki, 1980; Sackett, 1979). Clearly, it is important that health care organizations provide health care professionals with resources that assist them in the development of policies that lead to the facilitation of an integrated system that serves to improve patient adherence.

Diabetes Program Interventions: Organization of the Health Care System

Numerous studies since the 1980s have evaluated the effects of population-based primary care management (Brown, Nichols, & Glauber, 2000). The results show a variety of interventions and their effects across studies. Rubin, Dietrich, and Hawk (1998) pointed out that comprehensive programs for diabetes care are unlike basic programs that consist only of patient education-related services and focus on glycemic control. Comprehensive programs have a population-based approach to the organization of care and focus on all aspect of patient care.

Diabetes care programs can be categorized into hospital-based versus community involvement intervention, individual versus population-based intervention, unitary intervention versus multiple interventions, and physician-based care versus multidisciplinary care. Studies (Amoah et al., 2000; Kelly, Schumacher, Mayer, &

Brown, 2000; McCulloch et al., 1998; Wagner, Grothaus et al., 2001) show that intervention methods for diabetes care have shifted from unitary intervention, which has usually involved health education, to multiple interventions, including patient registry that enhances continuity of care, standardized diabetes care, accessibility of diabetes care in the patient's community, and empowerment of self-management.

Facilitation of continuity of care

Graham(1995) defined continuity of care as "the degree to which care for the patient is coordinated among practitioners, among organizations and, over time." Donabedian (1980) suggests that continuity and coordination of care should be given more attention when assessing the quality of care provided by several different professionals because these are especially important determinants of the quality of care.

Facilitation of continuity of care is a strategy that has been implemented in diabetes care and has resulted in improvements of that care. Weinberger et al. (1995) evaluated a nurse-coordinated intervention for primary care patients. Participants in this study consisted of 257 male veterans with type 2 diabetes who received primary care from general internists. Interventions included nurse-initiated telephone contacts on at least a monthly basis to provide patient education, facilitate compliance, monitor patient health status, and facilitate problem solving and access to primary care. Patients were also encouraged to call the nurses. The results showed no significant general effect on health-related quality of life and diabetes-related symptoms, but there was significant improvement in glycemic control in the intervention group (Weinberger et al., 1995).

Facilitation of access to care

Access to care can be determined by space, time, and financial resources. It is intertwined with resource allocation (Donabedian, 1980). From Donabedian's viewpoint (1995a), the responsibility for quality of care is shared by provider and consumer. The patient and family, as well as the community, must shoulder some responsibility in this regard. At the community level, the quality of care depends on the degree of access to care. He further pointed out that the availability of specially trained providers and the resources of health care systems have much to do with access to care.

Living in remote areas far away from health care institutions, along with education, language, and economic factors, can create problems of accessibility to care (Piette, 2000). Khunti, Ganguli, and Lowy (2001) investigated the determinants of good primary diabetes care service and found inequity in certain areas; but, if care was highly structured, patients had more access to diabetes professionals.

A random sampling of 799 people was conducted to evaluate the behavior of patients seeking medical care and the accessibility of that medical care in a remote area in Hualien County, Taiwan (Chang, Li, & Shaw, 1998). The results showed that people in remote areas had more medical needs and tended towards a higher utilization of outpatient, emergency, and in-patient care. Greater inconvenience in accessing medical care was also reported along with more time spent seeking medical care as opposed to people living in nearby townships.

Several studies have examined interventions designed to improve continuity of and access to care. In a trial of automated telephone disease management with nurse

follow-up, with 310 subjects in the intervention group and 228 in the control group, the results showed that telephone disease management was an effective program for diabetes care by helping to reduce the problems of access that were reported (Piette, 2000). The findings suggest that ongoing care, beyond visitation time, such as providing telephone follow-up, resulted in a higher quality of diabetes care in terms of counseling, shorter waiting times to see the doctor, etc., and this was positively correlated with patient satisfaction.

Improvement of access to care has also been implemented by the use of technology. In one study of 184 diabetes outpatients, an electronic case manager for diabetes control was implemented based on a personal computer (PC) platform (Meneghini, Albisser, Goldberg, & Mintz, 1998). Two interfaces were provided, one for the care provider (the physician or case manager) and one for the patient. The patient needed only a touch-tone telephone line, which linked to the patient interface hardware in the professional's computer. This allowed patients to enter their blood glucose measurements, lifestyle events, and other health symptoms. The health provider could then leave voice messages that provided instructions for the patient. Patients could access their data files through a personal password or identification number. Only the physicians or the designated case managers could make changes in medication, direct instructions, and leave messages for patients (Meneghini et al., 1998). The results showed a decrease in rates of reported hyperglycemia and hypoglycemia and a significant drop in HbA1c after 12 months. In addition, annual clinic visits decreased as well (Meneghini et al., 1998). The system could also identify diabetes crisis events so that patients could decide

whether they needed emergency care or not. This program provided patients with diabetes care on a daily basis without patients having to travel to clinics.

Multidisciplinary and interorganizational collaboration

The collaboration model, which provides patients with interdisciplinary care, includes both vertical and horizontal integration (Gulliford & Mahabir, 2001; Snail & Robinson, 1998). The former focuses on the continuity of care while the latter includes an alliance of multiple disciplines and management. Bope (1994) classified different forms of collaboration. Conferring, which refers to informal sharing of observations, is the simplest form. Cooperation among professionals is less formally structured than other types of collaborative care. Consultation is a formal aspect of collaborative care. Multiple entry and teamwork are the other forms of collaboration. The description of collaboration is related to the terms of coordination in the process of care as described by Donabedian (1980).

Miller, Freeman, and Ross (2001) indicated that collaboration is one of the multidimensional aspects of teamwork. They also indicated that measurement of teamwork effort is quite difficult. Studies have shown that collaboration has been implemented in different settings, with different combinations of professionals, and through different procedural designs (Brita-Rossi et al., 1996). The results of a majority of studies on the subject have shown an improvement in the satisfaction of professionals and patient outcomes when nurse/physician collaboration was implemented in intensive care setting (Baggs et al., 1999; Henneman, 1995), mental health care (Wells, Johnson, & Salyer, 1998), and emergency services (Sommers, Marton, Barbaccia, & Randolph,

2000). Similar improvement in satisfaction and patient outcomes have been found with respect to the implementation of collaboration among social worker/physician /nurse (Sommers et al., 2000), organizations (Fain, 1998; Mays, Halverson, & Kaluzny, 1998), hospital /community ("From the Board Room", 1998), practitioner/researcher (Rosswurm & Larrabee, 1999), and practitioner/educator (Mariano, 1989).

Zwarenstein and Bryant (2000) reviewed literature from the Cochrane database and concluded that a lack of nurse-doctor collaboration negatively influenced the quality and efficiency of patient care. Some studies have shown that collaboration shortened the average length of a hospital stay (LOS) and reduced hospital charges (Zwarenstein & Bryant, 2000). In addition, increasing collaboration improved outcomes of importance to patients and health care managers and had a major impact on the health care process (Zwarenstein & Bryant, 2000).

Collaboration has been implemented in diabetes care programs, integrating professionals from multiple disciplines and resources in the community. Philis-Tsimikas and Walker (2001) evaluated Project Dule, fore example, piloted in North San Diego County. This program provided outreach and education, recruitment, screening, diagnosis, clinical care, and educational services for low-income patients with diabetes. The program consisted of two components: a clinical component and a health promotion component. In the clinical component, high-risk diabetes patients with average blood sugar levels received intensive clinical care by a nurse-led team including an RN and a dietician. Patients also participated in diabetes self-management classes, and were assured access to pharmaceutical and glucose monitoring supplies, ophthalmology, and

podiatry care (Philis-Tsimikas & Walker, 2001). The health promotion component provided comprehensive bilingual diabetes education that was delivered for 12-weeks by community health workers, who were from the community and were trained to teach the diabetes self-management classes.

The results of the clinical component of this culturally sensitive program showed significant effects on measures of diabetes control and health promotion, including HbA1C, blood pressure, total cholesterol, and LDL (Philis-Tsimikas & Walker, 2001). There was excellent professional performance in adherence to the standards of care recommended by the ADA. In the health promotion component, significant improvement in HbA1C and total cholesterol was found and diabetes-related knowledge increased. Belief in ineffective, traditional, culture-based remedies decreased and satisfaction with services significantly improved. Individuals who received both classroom education and nurse-managed services experienced an increase in confidence in their personal control (Philis-Tsimikas & Walker, 2001).

A collaborative alliance between health care organizations can address health issues at the community level (Mays et al., 1998). Access to care can be facilitated through coordination and collaboration among disciplines as well as the formation of coalitions among organizations. Referral and consulting, therefore, the formal forms of collaboration, can be seen as the central elements of the process of quality care that facilitates accessibility.

Multi-intervention is a recent trend in system level programs in diabetes care. Wagner et al. developed the Chronic Care Model (CCM) that has been successfully

applied across populations with different chronic diseases as well as across a variety of organizations (R. E. Glasgow et al., 2001; Wagner, 2000; Wagner, Glasgow et al., 2001; Wagner, Grothaus et al., 2001). The CCM implemented in chronic care clinics includes patient registry, multidisciplinary clinics, standardized management, and group education/peer support groups. The results have shown that patients who received intervention with the CCM received more preventive-care services, and they had a higher rate of primary care visits, although a lower rate of specialized medical utilization than patients who received the normal form of care.

A pre-post evaluation study that examined the CCM (Wagner, Glasgow et al., 2001) suggested that team care based on collaboration improves the quality of care across different health care organizations and across multiple chronic illnesses. The results showed that the effects of chronic care clinics resulted in an increase in the number of primary care visits accompanied by a decrease in emergency room visits. Participants in the intervention group had a higher rate of participation in education programs and rated the helpfulness of all kinds of diabetes education more highly than did the control group, especially with respect to one-on-one and group education. Intervention group patients reported their general health status as better than did the control group. However, the means of HbA1C levels did not differ between these two groups.

Another multidisciplinary diabetes management program was implemented with a chronic care model of diabetes management in adult ambulatory practice sites of the Cambridge Health Alliance, with patients that represented a diverse multilingual population (Brunt et al., 2000). The model was designed to utilize the expanded roles of

trained nurses (RNs) and dieticians (RDs). The personnel tended to use RNs/RDs with linguistic skills appropriate to their sites rather than to use central teams of certified diabetes educators. The trained RN/RD teams met regularly with primary care providers (PCPs) t to review patient records and histories. The RN/RD/PCP teams also met periodically with diabetes project leadership teams (Brunt et al., 2000). The results showed improvements in the frequency of lipid, HbA1C, and urine microalbumin monitoring as well as improvements in mean HbA1C (Brunt et al., 2000).

Rubin, Dietrich, and Hawk (1998) evaluated a comprehensive diabetes management program. Diabetes NetCare[SM] used a population-based approach, and integrated and coordinated all aspects of medical care for the entire diabetes population. Diabetes NetCare[SM] employed a multidisciplinary team that worked with physicians and patients to implement health behavior changes and maintenance over the long term. Patients within this program were sent reminders about preventive screenings, appointments with physicians, and diagnostic tests. They were also encouraged to participate in educational classes and seminars. Each patient was assigned to a diabetes nurse case manager who helped patients with their self-management behaviors. The nurse case managers were responsible for managing all the health care needs of their patients (Rubin et al., 1998). Nine months after program initiation, a second random sample was surveyed. The data were evaluated with weighted cost averages arrived at in several categories of service utilization, including inpatient, outpatient, physician, pharmacy, and other. Baseline and follow-up clinical data were also evaluated, including eye exams,

A1C exams, foot exams, and cholesterol exams performed for each patient on an annual basis.

The results of Rubin's study were presented with respect to clinical and economic results and patient and provider satisfaction. The clinical results showed an improvement in the process of care with an increased percentage of A1C evaluation required, along with cholesterol tests, foot exams, and eye checkups. The outcomes showed that costs fell due to a decrease in hospital utilization. Furthermore, the follow-up satisfaction survey showed high ratings by both participants and physicians.

Besides interdisciplinary collaboration within the system, the Diabetes Shared Care Model in Taiwan focuses on patient-provider collaboration as well as collaboration across multiple disciplines, organizations, and communities. There is some solid evidence to suggest that the Diabetes Shared Care Model is an effective program with multiple interventions in Taiwan (Chiou et al., 2001b). The Shared-Care System has served to integrate patients, professionals, health care organizations, and community resources to facilitate patient empowerment, access to care, and continuity of care. The long-term effectiveness of the Shared Care Model, however, is still in need of further investigation.

Patient Characteristics

Numerous studies have examined the relationships among patient demographic, medical, social, and psychological factors, patient adherence, and the outcomes of diabetes care. The successful control of diabetes requires not only that health care professionals provide services, but also that patients adhere to the care regimen, which relies heavily on self-care management (Chiarelli et al., 1998). Patient adherence to a

self-care regimen was found to have a positive impact on glycemic control in an early study of adolescent patients with type 1 diabetes (Hanson et al., 1987). Self-care management is important because diabetes is a chronic illness that has a dramatic impact on patients' lifestyles for the rest of their lives (Kamel, Badawy, el-Zeiny, & Merdan, 1999).

Self-care management of diabetes includes regular check-ups, blood screening for glucose, cholesterol, and triglyceride levels. It also includes adherence, or what some researchers refer to as "compliance," with the medical regimen, including medication, foot care, regular monitoring of blood pressure and weight, daily life activities, exercise, diet, appropriate attention to illness, and smoking cessation. Since diabetes control is so complicated, Lo (1998) suggested that the extent to which patients comply with the requirements of diabetes self-care management is an especially critical issue.

Glasgow, McCaul and Schafer (Glasgow, McCaul, & Schafer, 1987) investigated relationships between adherence and glycemic control with a community sample of 93 adult with type 1 diabetes patients. The findings suggest that regimen adherence is the result of various factors, such as stress, individual metabolic factors, and the appropriateness of regimen prescriptions that may influence glycemic control, rather than simply representing a one-to-one relationship between adherence and control.

Some theoretical models have been developed concerning patient adherence to self-care regimens, self-care behavior, factors that influence adherence, and how to deal with patients' self-care problems (Boehm, Schlenk, Funnell, Powers, & Ronis, 1997; French, 1997; Glasgow, Hampson, Strycker, & Ruggiero, 1997; Hanson et al., 1987;

Haynes et al., 1979; Lo, 1998). Haynes et al. (1979) developed the earliest model of adherence or "compliance". He identified three broad categories for adherence intervention: cognitive factors, behavioral factors, and social support (Haynes, 2001). Lo (1998) borrowed concepts from various theoretical models to predict the factors involved in the self-care behavior of diabetes patients, thereby developing a model for adherence to a self-care regimen. Glasgow et al. (1997) surveyed the self-management of 2,056 diabetes adults with personal-model scales based on personal beliefs and social and environmental factors. They found that both personal beliefs and social and environmental barriers significantly predicted level of self-management in all three regimen areas being investigated (diet, exercise, and glucose testing) after controlling for the influence of demographic factors and medical history. Clearly, there are many factors that can influence the adherence of diabetes patients to self-care regimens.

A number of studies have examined the factors that influence patient adherence and have provided recommendations for clinical applications. These factors can be divided into five categories: patient demographic factors, disease-related factors, psychological factors, sociological factors, and cognitive-perceptual factors.

Demographic Factors

Even though some studies have shown many similarities in the adherence behaviors of men and women (Fitzgerald, Anderson, & Davis, 1995), Hellman, Baker, Flores, Lehman, and Bacon (1997) studied 215 adult diabetic patients who visited the diabetic clinic of a large health maintenance organization. The results showed that gender is one of the demographic factors that has an impact on adherence. Miyoshi (1999)

investigated a multidimensional model of patient adherence to type 2 diabetes care. The results showed that non-white, male individuals tended to report higher levels of adherence to the regimen. In the study by Lloyd and associates (1993), 592 childhood onset type 1 diabetes diabetic adults were examined in terms of their psychosocial correlates of glycemic control. The results showed that women reported higher or more adequate level of self-care adherence behaviors than did men. Men were found to be less likely to adhere to their self-monitoring of blood glucose (SMBG); and, subsequently, to require additional assistance in this regard (Karter et al., 2000). The different results regarding adherence between these two studies might be due to different samples with different types of diabetes or different types of treatment, namely with or without insulin.

The research indicates that age is also a factor that has an affect on adherence. In several studies, adolescents and the elderly have been found to be high-risk groups with very low levels of adherence. Wysocki, Hough, Ward, and Green (1992) investigated patient adjustment to type 1 diabetes during the transition from adolescence to adulthood (age 18-22). Adolescents, in particular, manifested less successful levels of adjustment to their illness as compared to other age groups and had lower levels of treatment compliance in late adolescence with poor diabetes control. Bond, Aiken, and Somerville (1992) tested the health belief model with 56 adolescents with type 1 diabetes. They concluded that adherence to exercise programs and injection regimens decreased as age increased. Lloyd et al. (1993) indicated that older patients maintained better control on the basis of an examination of their glycosylated glucose levels. Shobhana and associates (1999) evaluated patient adherence to treatment prescriptions and analyzed the reasons

for non adherence with a random sample of 386 type 2 diabetic subjects (M:F 223:163). They suggested that non-adherence was not related to age, but that memory loss was a problem among the elderly that did effect adherence. The same results were found in Glasgow, McCaul and Schafer's study (1986). According to the results of these studies, it seems safe to assume that different levels of adherence may be correlated with age, especially among certain types of diabetes patients, groups with or without insulin treatment, for example and different age groups.

Cultural differences may also influence adherence to self-care regimens, especially in the case of complex diabetes care. A few researchers have also attempted to investigate whether or not ethnicity has an influence on adherence. The study by S. Hellman and associates (1997), however, did not support the contention that ethnicity had a relationship to adherence. Miyoshi's study (Miyoshi, 1999) indicated that non-white individuals reported greater levels of subjective adherence. Nevertheless, patients in Mexican-American groups were found to be less likely to change their decades-long habits of eating and lifestyle in order to improve their health status (Swinney, 1988). Swinney also found that patient treatment goals emphasized maintaining social functions, while the health provider goal was to control abnormal biological laboratory values. Therefore, the teaching and treatment plans did not include patient-defined self-care needs, and this, in turn, impeded patient adherence to self-care regimens. Auslander et al. (1997) conducted a cross-sectional study that included 146 youths with diabetes (95 Caucasians and 51 African-Americans) and their mothers. They found that African-American youth reported significantly lower levels of adherence to their diets and

glucose testing than did Caucasian youths. Language barriers may also have a negative impact on levels of adherence. Oomen, Owen, and Suggs (1999) have suggested that cultural values and issues need to be treated with special attention and care.

Education level is another factor that may influence adherence to a self-care regimen (Shobhana et al., 1999). Adherence to a medication regimen has been found to be positively associated with level of education in a sample of 156 type 2 diabetes patients (Garay-Sevilla et al., 1998). Lower levels of education served as a barrier to adherence to self-monitoring of blood glucose in a large survey of 44,181 diabetes patients who were under pharmacological treatment (Karter et al., 2000). The results of Lloyd et al.'s study (1993), which included 592 adult patient with type 1 diabetes also revealed that more highly educated patients had better glycemic control and that education level was particularly important in influencing self-care performance.

Adherence to a diabetes care regimen was also found to be lower among poor patients and they had less satisfactory levels of glycemic control (Garay-Sevilla et al., 1998; Karter et al., 2000; Shobhana et al., 1999). In fact, non-adherence, generally speaking, was found to be more pronounced among patients from lower socio-economic status groups (Shobhana et al., 1999). Wealthier patients have been found to have better glycemic control (Lloyd et al., 1993). Self-management is essential to successful adaptation to type 2 diabetes, but low income Mexican American women have been found to have insufficient resources to help them with self management behaviors (Swinney, 1988). A lack of financial resources is associated with a lack of knowledge regarding the requirements or importance of self-care (Swinney, 1988; Tu & Morrison,

1996). Adherence to a diet regimen is also influenced by the relatively high cost of a low-fat, sugar-free diet (El-Kebbi et al., 1996; Garay-Sevilla et al., 1998). Low-income status, therefore, can be a factor of major influence in adherence to the care regimen.

Studies conducted in the United States have shown various associations between demographic factors and adherence to a care regimen. Minority groups, on average, have lower levels of education, lower incomes, and often have communication barriers as a result of English being a second or foreign language. These demographic characteristics make adherence to a diabetes care regimen even more difficult and complicated.

Disease-Related Factors

Disease-related factors include the type and severity of the illness and the length of time since diagnosis. Schoenberg, Amey, and Coward (1998) conducted ethnographic interviews of 51 older (65+) women with diabetes and their physicians. The findings indicated that the association between etiologic perspectives on diabetes and dietary adherence is stronger than is the case with sociodemographic factors. Less intensive therapy is another significant barrier (Karter et al., 2000). Williamson et al. surveyed 75 dietitians with respect to their perceptions about the barriers to diet adherence among diabetes patients. The results showed that the absence of symptoms has a negative impact on dietary adherence (Williamson et al., 2000). Thus, the severity of one's illness can also have an impact on adherence.

Adherence to diet was found to be positively associated with years since diagnosis in Garay-Sevilla et al.'s study, conducted with a sample of 156 subjects with type 2 diabetes (1998). The results of a study by Karter and associates (2000) with a large

sample of 44,181 subjects with all types of diabetes also showed the same association between diabetes duration and patient adherence to self-monitoring of blood glucose. The results of a study with a sample of 386 subjects with type 2 diabetes (Shobhana et al., 1999), however, suggested that non-adherence to medication was not related to the duration of diabetes. Since the content of adherence assessed was different in these two studies, the extent to which length of time since diagnosis serves as an enabler or barrier to adherence to different areas of self-care regimen is in need of further investigation.

Psychological Factors

Everett (1999), in a qualitative study, identified three psychological factors relevant to adherence: locus of control, self-efficacy, and health beliefs. Health beliefs can be characterized as cognitive-perceptual factors because there is a strong relationship between people's perceptions and their cognition concerning their health and disease. Everette suggested that patients need to be empowered to initiate and maintain adherence to their regimens. Lack of self-esteem and the absence of empowerment may have a negative impact on levels of adherence (Williamson et al., 2000). Lo (1998) indicated that self-efficacy is an important predictor of intention to abide by a self-care regimen. French (1997) discovered lower scores on a self-efficacy test for a group with diabetes complications than in a group without complications. These results indicate that severity of illness bears a direct relationship to levels of self-efficacy. Low levels of self-efficacy have a negative relationship to adherence. Therefore, enhancing self-efficacy may serve to improve diabetes self-management (Whittemore, 2000).

Locus of control is another predictor of self-care behaviors (Lo, 1998). In 1966, Rotter first suggested the idea of an internal locus of control, and hypothesized that people with an internal locus of control are better able to pursue behavior that can have a positive influence on their health status, while those who perceive an external locus of control are less capable of maintaining their health status (Schoenberg et al., 1998). Externality is associated with non-adherence, while internality is associated with adherence (O'Connor, Crabtree, & Abourizk, 1992). All of this suggests that perceptions concerning locus of control can and should shape treatment decisions, since they can have a profound influence on adherence (Lo, 1998; O'Connor et al., 1992; Schoenberg et al., 1998).

Another psychological factor is personality. Kern, Penick, & Hamby (1996) examined the relationship between personality and adherence to a diabetes control regimen. The results indicated a need to individualize strategies to increase adherence among patients. Depression is another psychological factor that is associated with poor adherence (Ciechanowski, Katon, & Russo, 2000).

MacLean and Lo (1998) have suggested, however, that research results indicate that factors governing failure to adhere to a regimen are not necessarily the counterpart of psychosocial factors correlated with successful adherence. Nevertheless, individual psychosocial characteristics are clearly major factors that can impede or enhance adherence. Psychological factors are associated with social support, treatment regimen requirements (Rubin & Peyrot, 2001), physician-patient relationships (Bergman, Akin, & Felig, 1990), and demographic characteristics (Enzlin, Mathieu, & Demyttenaere, 2002).

Social Factors

Relationships with health care providers and social support from one's family are also major components of the social factors involved in adherence. Glasgow, Strycker, Toobert, and Eakin group (2000) designed a study to apply a multilevel "pyramid" model of social-environmental support related to self-management across chronic diseases, and assessed levels of support and resources for each of seven categories (e.g., personal, family and friends, physician and health care team, work and organization, neighborhood, community, and media and policy). They found that the health care team and family and friends were rated as the highest levels of social support (Glasgow et al., 2000). The results of a study with 123 patients having heart disease, arthritis, diabetes, and/or COPD showed that higher levels of social support are related to better long-term self-management and health outcomes (Glasgow et al., 2000). This suggests that health care professionals and organizations would be able to exert a long-term influence over the control of diabetes.

Studies have shown that physician and health care team support has been rated as the most important of support resources (Glasgow et al., 2000). Similar results were found in a study of compliance among patients with hypertension in Taiwan (Hu, 1989). Clearly, therefore, the organization of the health care system is of critical importance to diabetes care. Glasgow, Wagner et al. (1999) pointed out that diabetes care needs multidisciplinary care that usually introduces organizational and system change.

Professional-patient relationship

Lo (1998) argued that the single most influential factor is the quality of the relationship between health providers and the client. The quality of doctor-patient communication is highly correlated with diabetic self-care behavior (Freeman & Loewe, 2000; Huka et al., 1975). Physicians' attributes and practice style also contribute to patients' adherence to treatment programs (DiMatteo et al., 1993; Garay-Sevilla et al., 1998).

A lack of communication can cause serious problems in the relationship between patient and physician (Freeman & Loewe, 2000). Swinney (1988) interviewed and compared the perceptions of 19 Mexican American women with that of their health care providers concerning diabetes treatment goals. The researcher found that patients and physicians failed to share common expectations. Freeman and Loewe (2000) used qualitative methods, including semi-structured interviews with patients and clinicians and direct observation of clinical precepting sessions by trained observers at an inner-city family practice training site, to explore patients' and physicians' different viewpoints concerning the disease. The results showed that different conceptions of the term ‘control’ effect the ability of patients and clinicians to communicate effectively. The tendencies of clinicians to view their own management strategy as scientific truth, and their focus on managing numbers rather than attempting to understand their patient's conception of disease and treatment goals, leads to frustration and presents serious obstacles to effective collaboration. This lack of common perceptions between physicians

and patients, especially concerning the goals of treatment, has a negative impact on patient adherence (Helseth et al., 1999).

Social support

The second major component involved in the impact of social factors is family support. Social support from the family is one aspect of environmental support. Even though some authors have warned that higher levels of social support from family and friends may have a negative impact on diabetes self-care activities due to their inaccurate information about diabetes regimens (Glasgow, Toobert, & Gillette, 2001), social support has been found to be positively related to health behaviors (Glasgow et al., 2000; Glasgow et al., 1989; McCaul et al., 1987).

Adherence to diet and an exercise regimen are significantly enhanced by perceived social support (Pham, Fortin, & Thibaudeau, 1996). Glasgow, Toobert and Gillette (2001) suggest that identifying patients who have low levels of social support is important in diabetes care.

Family support can lead to success of patient adherence to their medical regimen (MacLean & Lo, 1998). Lack of family support and family pressure to violate one's diet are especially serious obstacles to adherence (El-Kebbi et al., 1996). MacLean and Lo (1998) investigated the factors governing the success and failure of 95 type 2 diabetes patients to adhere to their regimen. The results suggested that family support could go a long way towards contributing to the success of a patient's adherence to their medical regimen. McCaul et al (1987) examined psychosocial predictors of regimen adherence among 107 persons with type 1 diabetes mellitus. They found that environmental support

was related to adherence to insulin administration and glucose testing regimens. The circumstances associated with barriers to testing blood sugar represent other issues of critical importance in terms of social support (Jones, Remley, & Engberg, 1996). Social support from people beyond one's immediate family is also a valuable resource.

Earlier studies have shown that the patient-partner-professional triad and the family-centered care model have a strong relationship with desirable patient outcomes (MacElveen et al., 1975). The influence of social factors on adherence is related to personal, diabetes-specific, social and problem-solving skills (Glasgow et al., 1989). Thus, involving a patient's family and strengthening diabetes-related social skills are important components of each individualized care plan.

Cognitive-Perceptive Factors

One consistent finding in diabetes research is that patients' cognition and perception of their disease will influence their adherence to their regimen (Cooper, 1998). Studies have shown that patients are less likely to adhere to the care regimen if they do not understand their disease, its treatment, and the care that is required (Anderson, Fitzgerald, & Oh, 1993; MacLean & Lo, 1998). One study investigated the barriers to diet adherence among 45 urban, low-income black patients with type 2 diabetes (El-Kebbi et al., 1996). Lack of knowledge about dietary factors, including food exchange systems and analyzing food labels, was found to have a negative influence on adherence to the dietary regimen. Similar results were also found in Taiwanese studies (Y. M. Chen et al., 2001). Chen and her associates investigated the relationships between patient diabetes-related knowledge and diabetes self-care activities with a sample of 112 middle

age diabetes outpatients. They found that level of education and occupation were the only characteristics that influenced scores of diabetes knowledge. In addition, patient diabetes-related knowledge was found to be the major predictor of patient adherence to self-care regimen. These researchers further suggested that providing diabetes education could improve patient adherence by enhancing diabetes-related knowledge.

In McCaul et al's study (1987), however, which examined the psychosocial predictors of regimen adherence among a sample of 84 adults and 23 adolescents, the results showed that regimen knowledge was unrelated to adherence. Nevertheless, it seems safe to say that accuracy of diabetic knowledge can influence a patient's adherence to the care regimen, at least to some extent. Williamson et al. (2000) found that diabetes patients usually received misinformation from family, peers, and others with diabetes. Culture-bound beliefs are also related to accuracy of knowledge about disease and treatment, and have an influence on patient adherence and care outcomes (Tu & Morrison, 1996). One could also conclude, however, on the basis of these different results obtained by different studies conducted with different age groups, that knowledge may have only an indirect influence on patient adherence to self-care regimens.

Patients' willingness to adhere to the regimen is also influenced by the perceived threat of their illness. Persily (1996) investigated the adherence of women with gestational diabetes and found that adherence decreased among those who perceived that gestational diabetes mellitus could have a great impact on their lives. Bond and associates (1992), investigating the health belief model of adolescents; however, found that the greatest level of adherence was achieved with a low perceived "threat" and a high level

of perceived "benefits-costs." Hendricks and associates (1999) found that patients' adherence improved after they were given a blood sugar test and their blood pressure and weight were monitored with each clinic visit.

Different perceptions between patients and health care providers about the disease and related treatment have been shown to affect adherence to the recommended care regimen (Boyer et al., 1996). Swinney's study (1988) showed that there were significant differences in the perception of treatment goals between Mexican-American women with type 2 diabetes and their primary health providers, which contributed to poor diabetic control. Diabetes educators' Perceptions of patient adherence are often different from patients' perceptions of adherence, and this may indicate that diabetes educators do not adequately understand factors that influence patients' adherence. These different perceptions have a direct bearing on self-care activities.

Finally, even though patients may have accurate knowledge and similar perceptions as those of their physicians, barriers to treatment and adherence to the care regimen may remain (Glasgow et al., 1997; Lo, 1998). Knowledge of the diabetes self-care regimen was found to be unrelated to adherence for either adults or adolescents in a study by McCaul et al. (1987). McCaul et al. indicated that psychosocial variables such as expectancy and environmental support are better predictors of adherence than knowledge. In another study by Glasgow and associates (1997), respondents clearly knew that diabetes was a serious disease and that their self-management activities would likely control their diabetes and reduce the likelihood of long-term complications, but, nevertheless, many obstacles remained to adherence to the care regimen. In a study by

Jones and associates (1996), individuals who tested their blood sugar less frequently were more likely to report a higher number of obstacles to adherence. The mere perception of barriers or obstacles will tend to have a negative influence on patient adherence to the self-care regimen.

All of the above evidence indicates that a patient's knowledge and perception of the threat to their health contributes to their perceptions of barriers to adherence and, in turn, affects adherence itself. Adherence to self-care regimens is associated with patient demographic characteristics and the diabetes care and education program that they can access.

Methods to Measure Quality Outcomes

It is essential to the assurance of quality of care to monitor all of the major indicators that are related to the structure, process, and the outcomes of health care (Gambone, Reiter, & Lench, 1990). This section, therefore, presents methods for measuring elements of health care quality.

Methods for Measuring Organizational Structure

The quality of structure is largely measured by the amount and quality of resources of the organization and the overall quality of medical equipment and facilities (Gambone et al., 1990; Oberklaid et al., 1991). Key structural indicators used in reviews by the IOM include both hospital-specific and staff characteristics (Pierce, 1997). Hospital specific characteristics include governance, size, presence of specialized units, payer mix, extent and quality of computer-based patient records, census, and presence of continuous quality improvement of programs. Staff characteristics include number of

full-time staff, attendance, resident physician staffing, numbers, proportions, and types of nursing personnel, educational qualifications, turnover rates, and use of agency personnel (Pierce, 1997) . The quality of computer-based patient records used for communication and the sharing of information between disciplines and among agencies are also important factors that influence professional performance (Gatling et al., 1997). The quality of the diabetes health care team (Amoah et al., 2000; Glasgow, 1995), and continuing professional education (Hill & Alexander, 1996) have also been thought to have positive effects on the quality of diabetes care.

Methods for Measuring Process and Outcomes

Mortality and morbidity are outcomes that have been used to monitor the quality of care for many years (Fuller, 1998; Greenfield et al., 1995). The ultimate impact of health care quality on the patient includes a reduction of mortality and morbidity rates and the improvement of health status (Henrichs et al., 1993; Oberklaid et al., 1991). Outcome measures include levels of clinical improvement, cost-effectiveness, and quality-of-life issues (Epstein & Sherwood, 1996; Gambone et al., 1990; Oberklaid et al., 1991). The IOM and the American Nursing Association (ANA) have measured major nursing care outcomes in terms of mortality, adverse events, patient satisfaction, and changes in health status (Pierce, 1997).

Many diabetes care programs have been designed to enhance patients' self-management. With respect to evaluating the effects of certain programs, outcome measures have become an important education/evaluation tool to support quality improvement and for assessing accountability and comparative reporting. Thus, how to

validly and reliably evaluate outcomes of diabetes patients' self-management has become an especially important issue in diabetes care.

Process of care

Process outcomes refer to the evaluation of the processes that are required for providing care (Renders et al., 2001). In the interventions of the diabetes care program described in the previous section, diabetes process outcomes were usually defined in terms of professional performance and satisfaction. Professional performance included professional adherence to diabetes guidelines, preventive measurement, documentation of risk factors of diabetes complications, screening examinations for complications, making follow-ups, and referrals (Akel & Hamadeh, 1999; Brown et al., 2000; Brunt et al., 2000; Chiou et al., 2001a; Harris, 2000; Kelly et al., 2000; Marshall et al., 2000; Renders et al., 2001; Rubin et al., 1998). In addition, the number of patients registered, number of qualified diabetes health care providers, accreditation of health care institutions, and referral systems are all important structural aspects of care delivery (Amoah et al., 2000; Brown et al., 2000; Carlson & Rosenqvist, 1988; Chiou et al., 2001a). Data for the subcategory of process outcomes are usually collected from medical records and registering organizations. Some data that are missed may be collected from patient self-reported surveys. Furthermore, the level of professional satisfaction may also be collected from interviews with diabetes care providers (Carlson & Rosenqvist, 1988; Lee, 2000; Rubin et al., 1998; Wagner, Glasgow et al., 2001). Professional attitudes and level of satisfaction have an impact on the willingness of professionals to implement new care

programs. Finally, community support activities and accessibility to health care are also important aspects of outcomes measures for diabetes care (Harris, 2000; Lee, 2000).

Diabetes professional performance

Sando, Hagen, and Beck-Nielsen (1994) developed a professional performance evaluation system for quality monitoring of outpatient diabetes care. The metabolic control of diabetes mellitus was evaluated by an annual measurement of serum A1C, triglyceride, total cholesterol, body weight and blood pressure, and the result was used in the calculation of a metabolic score. Diabetic nephropathy and retinopathy were also evaluated once a year according to international classifications. They collected data, however, in only one hospital. The performance rates were not satisfactory (A1C 94%, but other parameters were only 46-75%). Poor regulation of glycemic control (52.3%) was found in insulin-dependent diabetes patients and in type 2 diabetes patients (41.5%). The authors concluded that the results suggested a failure in process quality (Sando et al., 1994).

Another study also showed inconsistency between professional performance and recommendations for diabetes care. According to data collected in the U.S. between 1988-1995, a gap was found to exist between recommended diabetes care and the care patients actually receive (Saaddine et al., 2002). Data for participants aged 18-75 and diagnosed with non-gestational diabetes was compiled by the third U.S. National Health and Nutrition Examination Survey (NHANES III) (1988-1994) and the Behavioral Risk Factors Surveillance System (BRFSS) (1995). Eighteen percent of participants (95% Confidence Interval, 15.7% to 22.3%) had poor glycemic control (A1C > 9.5%), and

65.7% (CI, 62.0% to 69.4%) had a blood pressure reading of less than 140/90 mm Hg. Cholesterol was monitored biannually in 85.3% (CI, 83.1% to 88.6%) of participants, but only 42.0% (CI, 34.9% to 49.1%) had LDL cholesterol levels that were less than 3.4 mmol/L. Whether patients were insured or were being treated with insulin injections were also factors that influenced the professional provision of preventive care (Saaddine et al., 2002).

Patient outcomes

Donabedian (1995b) defined 'outcome' as what was accomplished for patients. Outcomes permit an inference about quality (Donabedian, 1995b). Therefore, outcomes have become the principle indicator that health care providers use to evaluate the quality of care provided. Outcome data refers to information describing the health status of the patient as a result of the receipt of care (Palmer, 1991). Donabedian (1980) pointed out that outcome data are related to biological, physiological, psychological and social health. Patient outcomes can be categorized based on characteristics of diabetes self-management. Donabedian (1982; 1995b) and Glasgow, Boles, et al (1999) include four dimensions of measurement: medical-biochemical measures, psychological measures, behavioral/activities measures, and quality of life.

Medical-biochemical measures

The first category is medical-biochemical measures. Glycemic control is the most commonly used in this category (Akel & Hamadeh, 1999; Aubert et al., 1998; Gatling et al., 1997; Rubin et al., 1998; Wagner, Glasgow et al., 2001). "Tight" glycemic control has been found to be able to prevent the development and progression of diabetes

complications (Gatling et al., 1997; Hellman, Regan, & Rosen, 1997). Diabetes complications have also been found to result from increasing A1C levels above the non-diabetes range (Herman, 2002). A1C that reflected mean plasma glucose concentrations over two months, therefore, have commonly been used to evaluate the outcomes of diabetes care (Gatling et al., 1997). Patient self-management is thought to influence glycemic control and to reduce risk factors that introduce diabetes complications.

Besides glycosylated hemoglobin (A1C), fasting plasma glucose (FPG), cholesterol level, lipid level, and body weight (BW) have been used as outcome measures of diabetes care (Akel & Hamadeh, 1999; Aubert et al., 1998; Brunt et al., 2000; Rubin et al., 1998). Occurrence of a diabetes complication and mortality are also considered to be patient outcomes for long-term evaluation study (Aubert et al., 1998; Brown et al., 2000). Data are usually collected from medical records. Some data, such as that pertaining to complications, can be collected from patient-report especially if medical documentation is incomplete or inaccessible.

Psychological measures

The second category is psychological measures. Knowledge, belief, attitude, and behavior are the psychological measures used in diabetes education designed to improve patient knowledge and skills of self-management. Studies have shown that patients who have positive attitudes about diabetes are more likely to adhere to recommendations (Anderson et al., 1993). Anderson and Fitzgerald have suggested that particular beliefs might constitute barriers or supports for helping patients to manage their diabetes. Some researchers also used attitudes and barriers as measures to evaluate patient adherence

(Glasgow et al., 1997; Glasgow et al., 1986; Hanestad & Albrektsen, 1991). The measures within this category mediate outcomes of patient self-management. They may be used as an outcome assessment tool for health care providers to tailor diabetes care to meet the needs of individual patients.

Self-efficacy is another psychological measure of patient outcomes. Self-efficacy is related to the willingness and the ability of patients to engage in self-management behavior (Anderson, Funnell, Fitzgerald, & Marrero, 2000). Lorig (1996) developed a measure for chronic disease patients to assess self-efficacy in the performance of self-management behaviors. The measurement includes exercising regularly, obtaining social support, and communicating with a physician. Anderson et al. (2000) developed the Diabetes Empowerment Scale (DES) to measure diabetes-related, psychosocial self-efficacy. Both authors indicated that self-efficacy could influence patient adherence to a self-management regimen.

There have been a variety of results obtained concerning relationships between diabetes knowledge, patient adherence, and A1C. Chan and Molassiotis (1999) examined the correlation between diabetes knowledge and patient adherence with a convenience sample of 52 Chinese outpatients (Age: 48.7) with type 2 diabetes in Hong Kong. The results indicated that there was no association between diabetes knowledge, on the one hand, and adherence and glycemic control on the other. However, in a Taiwanese study with 74 outpatients with type 2 diabetes (average age: 65.5), diabetes knowledge and behaviors were found to be related to A1C, regardless of patients' age, gender, level of

education or diabetes history (Chong & Lin, 2000). Whether diabetes knowledge can be a valid outcome measure needs further investigation.

Behavior/activities measures

The third category of patient outcomes of self-management is behavior/activities measures, also called adherence. Adherence is " the extent to which a person's behavior coincides with medical or health advice" (Haynes et al., 1979). Thus, adherence is an action through which one engages in self-care activities. Adherence in diabetes means sticking to the care regimen that should be implemented for the rest of a person's life. Adequately understanding a patient's adherence, therefore, require needs longitudinal assessment. Self-management activities in the areas of nutrition, exercise, smoking cessation, and foot care are usually used to measure patient adherence, along with education received concerning the self-care regimen. Other areas, such as medication and self-monitoring of blood glucose, are sometimes included as well. Two studies (Toobert & Glasgow, 1994; Toobert et al., 2000) suggested that adherence should be measured in different areas of diabetes self-management activities, rather than measuring them as a whole. These authors developed several subscales for each area of self-care activities. However, the overall level of patient adherence to self-care activities may also be a valuable resource for assessing outcomes of health services provisions. Further details concerning the literature regarding measures of diabetes self-care activities is presented in Chapter III.

Quality of life

The fourth category of patient outcomes is quality of life. Brook and Donabedian cautioned that quality of care cannot be equated with quality of life (Donabedian, 1980). Donabedian (1980), however, has suggested that the aspects of quality of life that medical care contributes to should be taken into account.

Quality of life is measured with multiple domains. Shen et al. (1999) designed a questionnaire for measuring the quality of life of diabetes patients. The questionnaire contains 8 domains, including: physical function, energy/fatigue, health distress, mental health, satisfaction, treatment satisfaction, treatment flexibility, and frequency of symptoms. Clearly, therefore, measurements of quality of life provide a comprehensive model for explaining self-management behaviors.

Lo (1996) conducted a study of 207 patients with type 2 diabetes to investigate their health-related quality of life. Results showed significant differences in quality of life based on patient characteristics such as age, gender, marital status, incomes, and occupation. Other forms of diabetes-related information, such as comorbidities and hospitalization due to complications, are also important. Different treatment patterns have an influence on different perceptions of quality of life in the psychosocial domain. Blank (1991) analyzed the influence of quality of life factors in a study based on a sample of 267 adult diabetes patients in two groups, those who self-administered insulin and those who did not. The results showed that quality of life did not differ across the two groups. A patient's significant other also plays a very important role. Social support had a higher predictive effect on quality of life with type 2 and type 1 diabetes groups than with the

type 2 group that self-administered insulin. Stress and psychological adjustment factors were predictive for quality of life in all groups and negative predictors of well-being in the type 2 diabetes with insulin group.

Self-reported quality of life and perceived health and functional status are usually seen as outcomes of health care (Aubert et al., 1998; Harris, 2000; Marshall et al., 2000). Hornquist defined quality of life as a "recognized need and functional satisfaction within a number of fundamental life domains, with special emphasis on well being" (Hanestad & Albrektsen, 1991). Clearly, diabetes complications are associated with patient quality of life (R. E. Glasgow et al., 2001). Basa and Mcleod (1995) indicated that improvement in quality of life should be one of the primary goals of diabetes education programs. In a study with 280 patients with type 2 diabetes under 65 years old, the results showed that health-related quality of life (HRQOL) was associated with regular clinical reviews (check-ups at least twice a year) and continuity of care (the same GP for at least 2 years), education by a diabetes nurse, and satisfaction with diabetes education (Hanninen, Takala, & Keinanen-Kiukaanniemi, 2001). The authors suggested that a permanent physician-patient relationship might improve HRQOL in subjects with type 2 diabetes.

Missing data are the greatest limitations of a longitudinal data set and are difficult to collect through follow-up. There is still much to be learned about what functional status and well being measures can show us about the relationship between health care services and patient health (Kania, Richards, Sanderson-Austin, Wagner, & Wetzler, 1996).

Other patient outcomes such as patient satisfaction (Renders et al., 2001; Rubin et al., 1998) have also been used to evaluate the quality of diabetes care. Medical utilization was used to estimate cost reduction from the intervention programs (Brown et al., 2000; Rubin et al., 1998). Economic outcomes can be represented by patient medical care utilization such as clinic visits, bed days of hospitalizations and emergency department visits (Rubin et al., 1998).

Selection of Outcomes Measure

Selections of outcomes measure were varied. Some studies used process outcomes (Amoah et al., 2000; Carlson & Rosenqvist, 1988; Chiou et al., 2001a; Lee, 2000), some used patient outcomes (Aubert et al., 1998), and some used both (Akel & Hamadeh, 1999; Brown et al., 2000; Brunt et al., 2000; Harris, 2000; Marshall et al., 2000; Wagner, Austin et al., 2001; Wagner, Glasgow et al., 2001; Wagner, Grothaus et al., 2001). Rubin, Dietrich, and Hawk (1998) added economic outcomes as one of the outcomes variables. Chiou et al. evaluated the feasibility and the effectiveness of the Diabetes Shared Care System with process outcomes along with the structure of the system (Chiou et al., 2001a). Nevertheless, long-term patient outcomes are in need of further examination

It is essential to the assurance of quality of care to monitor the indicators related to structure, process, and outcome of health care (Gambone et al., 1990). Mitchell, Ferketich, & Jennings (1998) proposed a quality health outcomes model that had no single direct connection linking interventions and outcomes. They indicated that interventions effect and are in turn effected by both system and client characteristics in

producing desired outcomes. Furthermore, the connection between system and client suggests that no single intervention acts directly through either system or client alone (Mitchell et al., 1998). Rather, there is a symbiotic relationship between the two; hence, the characteristics of both organizations and clients need to be taken into consideration.

Additional important considerations in evaluation of outcomes of care

Health care providers and administrators have pursued optimal care for diabetes control and prevention of its complications. Identification of the most effective and efficient program of quality care, however, is quite difficult. There are some problems when evaluating the outcomes of diabetes care programs.

The first problem is accessibility and validity of data. Brown et al. (2000) studied long-term outcomes of a diabetes care program and found that outcomes data were incomplete in medical records. Some studies used self-reported data to replace data that were incomplete in medical records. However, self-reported data may have biases due to inaccurate patient memory. In one long-term evaluation study (Brown et al., 2000), a new electronic medical record system helped to resolve this problem.

Another problem is the open question of whether the outcomes resulted from the interventions or the consequences of patients' risk factors, or other factors (Iezzoni, 1997). The evaluator should pre-define risk factors for adjustment in order to exclude their influence on outcomes when interpreting the effects of intervention. In Brown et al's 10-year, long-term follow-up study (Brown et al., 2000), the discrepancy of age, gender, duration of membership in the health care plan, and level of pharmacy benefits were controlled in groups to compare the effects of the evolution and changes of

organizational structure and processes of care. However, most studies at the system level studies did not adjust for patient risk. The control group is difficult to design in population-based approaches to outcomes management. Fleming et al. (2001) pointed out that linking process measures to important patient outcomes is crucial. They also suggested that feasibility, reliability, and variability are the criteria that should be considered when establishing the measures.

A third problem is the appropriateness of analyzing and interpreting outcome data. For example, the question remains open of the extent to which higher levels of professional performance result in higher levels of improvement. In Brunt et al's study (2000), the outcome measures used to evaluate the diabetes care program were medical processes and mean levels of A1C. They concluded that the process improved in accordance with the frequency of monitoring. However, the higher frequency may exceed the requirement of diabetes guidelines. It may have been better to ask whether the monitoring performance obtained the required minimum number.

A fourth problem is the difficulty in defining the unique contribution of an intervention in the content of multiple interventions and their impact on outcomes, because the paradigm has been shifted from unitary intervention to multiple interventions. The key element of multiple interventions is the enhancement of patient self-management. Patient skill, knowledge, and motivation for self-care are important determinations of health outcomes (Harris, 2000). Questions remain with respect to how patients receive information and whether that information is correctly perceived. Self-management can influence glycemic control; however, it is rarely used in large-scale

studies seeking to evaluate diabetes care programs. The results of the Diabetes Control and Complications Trial (DCCT) suggested that the key element that influenced the success of diabetes control was increased frequency of clinic visits involving nurses and dietitians ("Resource utilization and costs", 1995). This may be because diabetes patients who did not visit their physician regularly were less likely to adhere to their self-care regimen (Harris, 2000). Therefore, self-management adherence needs to be used as an outcome measure of diabetes care program in the future.

Outcomes measures vary according to the goals of the evaluator. Nevertheless, glycemic control, diabetes knowledge, patient adherence to self-care regimen, and quality of life are all crucial for measuring the quality of diabetes care.

Summary

In summary, this review of the literature has examined the concept of quality of care, has described diabetes care programs and outcomes, and has described organizational and patient factors that may influence outcomes. Finally, methods of measuring aspects of quality and outcomes have also been described.

CHAPTER III

METHODS

Introduction

This chapter presents the methods and procedures that were used in this study. Details of the research design, description of the population and sample selection, procedures for data collection, the pilot study, instrumentation, data analysis, and consent and protection of participants are described.

Research Design

This research was a cross-sectional, descriptive study designed to assess quality of care among persons with diabetes in Hualien County, Taiwan. The population studied was the diabetes clientele of Tzu-Chi General Hospital (TCH), the only medical center in eastern Taiwan, serving a population of approximately 350,000. The sample employed was randomly selected from a list of diabetes clients served by this hospital.

Two sources of data were used to construct the database for assessing the quality of diabetes care. One data source was a participant self-reported survey conducted via mail, phone, or face-to-face interview. The other data source was medical records. The participant self-reported survey packet contains four questionnaires: (1) the Diabetes Personal Data Sheet, (2) the Patient Perception of Diabetes Care Quality Questionnaire, (3) the Summary of Diabetes Self-Care Activities Questionnaire, and (4) the WHO Quality of Life Questionnaire. Letters describing the study and asking permission for the investigator to telephone the potential participant were mailed from the Director of

Diabetes Education Center of TCH to randomly selected persons who met the sampling criteria. Each letter also contained a postcard so persons who were willing to be contacted could return to the investigator. This was followed by a telephone call requesting participation in this study. After oral agreement, the questionnaires were mailed, and were then completed and returned by mail. For some participants, the investigator or her assistant obtained responses via telephone or face-to-face interviews. The medical records were reviewed using the Medical Record Checklist, which documented recent (over the last year) clinical examination data (glycemic control and prevention of diabetes complications) and data concerning diabetes health education. Medical records data were also used by the investigator in completing the Diabetes Professional Performance Checklist

The study design was approved by the Departmental Review Committee and The University of Texas at Austin Institutional Review Board prior to data collection.

Population and Sampling

Population

The target population for this study was all adult diabetes clients living in Hualien County, in eastern Taiwan, who met the sampling criteria. The accessible population, from which the sample was selected, was diabetes clients who visited Tzu-Chi General Hospital (TCH) from 2000 to 2001. This accessible population was chosen for the study because TCH was the only medical center in eastern Taiwan and many people went to TCH to seek various kinds of advanced or special treatments or examinations that were unavailable anywhere else in Hualien County. In the year 2001, the number of clients at

TCH with a diagnosis of diabetes was about 3,000. People who visit TCH clinics generally require more advanced treatment than those who are seen at other advanced primary clinics or hospitals in the community. Because the findings of this study were obtained from a randomly selected sample, they might be generalizable, at least to some extent, to the entire accessible population, in other words, our target population. Even though the diabetes status of participants in this study might well have been worse than that of those who had not been seen in the medical center, the data obtained from these participants provides valuable results that serve to illustrate the more salient factors associated with the quality of diabetes care in Hualien.

Sample Size

Fourteen predictor variables were examined for their contribution to the quality outcome dependent variables. According to Knapp and Campbell-Heider (Knapp, 1996; Knapp & Campbell-Heider, 1989), the sample size for multiple regression analyses should be at least 10 times the number of variables. Thus, the minimal number of observations should be 140. According to the results of several studies in Taiwan, patient-physician relationships, age, and family support accounted for 21% of the variance in patient adherence (R^2= .21) (Houng, 1994). In Liu's study (1999), for example, level of education accounted for 18% (R^2= .18) and social support accounted for 23 % (R^2= .23) of the variance in diabetes self-management behaviors. The squared multiple correlation coefficient (R^2) of variables in this study, therefore, can be estimated to be more than .23. Cohen's computer program of statistical power analysis for

regression tests was used to estimate the sample size with $\alpha = .05$, power .90. A minimal sample of about 105 was needed. The final sample size of the study was 140.

Sampling Criteria

Inclusion/exclusion criteria are listed below, followed by a description of strategy:

1. Participant diagnosed with type 1 and type 2 but excluding gestational diabetes.
2. Participant lived in Hualien County and the address within Hualien County was documented in medical center records.
3. Male or female.
4. Speaks and understands Chinese Mandarin or Taiwanese.
5. Age from 18 to 70 years old on January 1, 2003.
6. Diagnosed with diabetes for more than one year at the time of data collection.
7. Patients with severe diabetes complications or those who were not able to complete data collection requirements, such as patients with stroke, amputation of both legs, end-stage renal disease, or severe mental disorders, were excluded.
8. Patients under the care of the psychiatric department at TCH during the course of one year preceding the study, as documented in medical records, were also excluded.

Sampling procedure

One hundred and forty participants with completed questionnaires and medical records were obtained from a list of potential subjects provided by the Medical Center in Hualien County, Taiwan, on the basis of a series of sampling and sorting procedures. The procedure involved is described below (see Figure 2).

A total number of 511 letters of invitation were sent out, with potential subjects selected on the basis of three random samplings from a list of 3,805 people with diabetes. Those persons who had been diagnosed with cerebral vascular disease, end-stage-renal disease, and/or amputation of both legs were excluded from the pool of potential subjects. Thirty-one letters were returned by the post office due to having the wrong address. One hundred and sixty-three people replied that they would be willing to participate in the study. Finally, 148 completed questionnaires were obtained either by face-to-face or telephone interviews, or returned through the mail. The response rate, therefore, was 30.83% (148/511).

The original list of potential subjects included 3,805 people who were diagnosed with diabetes yet had not yet developed any severe complications and had visited clinics in the medical center in 2000 and 2001, regardless of their age. The list was further narrowed by using the initial ICD-9 number 250. Ten percent of these people, 669 cases, were randomly selected in the first sampling by using the Microsoft Excel program. As a result of this careful preliminary investigation, invitation letters (Appendix A) were sent to 204 potential participants that matched the sampling criteria. 59 people responded that they were willing to participate in the study. 563 cases were randomly selected in the second sampling from the rest of the list and the same procedure was followed, with 229 invitation letters being sent. 44 of these potential subjects responded that they were willing to participate in the study. In the third sampling, out of 516 random selections, 188 invitation letters were sent out with 60 people responding that they were willing to participate in the study. A total number of 163 people with diabetes responded, therefore,

to the invitation letters, confirming their willingness to participate in the study. At this point, the investigator and her assistants began to contact these subjects and collect data through face-to-face or telephone interviews as well as questionnaires sent through the mail, according to the respondents' preference. Three of the respondents were hospitalized during the phase of data collection, two were out of town at the time that was scheduled for their appointment, two refused to respond due to what they perceived to be the burdensome nature of the questionnaires, and nine persons simply failed to reply to the questionnaire sent through the mail. Finally, therefore, 148 responses to the questionnaires were obtained. Sixty-three questionnaires were obtained by face-to-face interviews, two by telephone interviews, and 83 by completing the questionnaire sent through the mail. Three questionnaires were discarded because they had answers for less than half of the total number of items. One questionnaire was discarded because it was determined that the respondent had already been diagnosed with the complication of end-stage renal failure in 2002. After obtaining this final set of usable data, 144 questionnaires, the investigator and her assistant began to review the respondents' medical records.

All of the medical records for the year 2002 were collected from the medical center, two regional hospitals, two district hospitals, 8 public health stations, and 16 private clinics in Hualien County, on the basis of a letter of introduction to the study from the Hualien County Medical Association. Some people visited more than one clinic for diabetes treatment. The investigator searched, therefore, for each participant's medical records from every clinic where he or she had reported being treated. One hundred and

forty-one participants' medical records were obtained. The medical records for 2002 of three respondents could not be obtained. Two of them were excluded from the study since one had visited a clinic outside of Hualien County, and the other had not visited a clinic for diabetes treatment. The third respondent whose medical records could not be found in the clinics that the respondent reported visiting in 2002 was still included on the basis of records found for 2001 and 2003. Despite the fact that the respondent might not have visited a clinic for diabetes treatment in 2002, his questionnaire remained in the study.

Our analysis proceeded, therefore, on the basis of 140 participants with complete data. Four additional respondents were excluded after a review of their medical records, since two patients had been diagnosed with spinal cord injury and lung cancer, respectively, which might have had an influence on the objectives of this investigation, along with the two persons whose medical records could not be found, as described above.

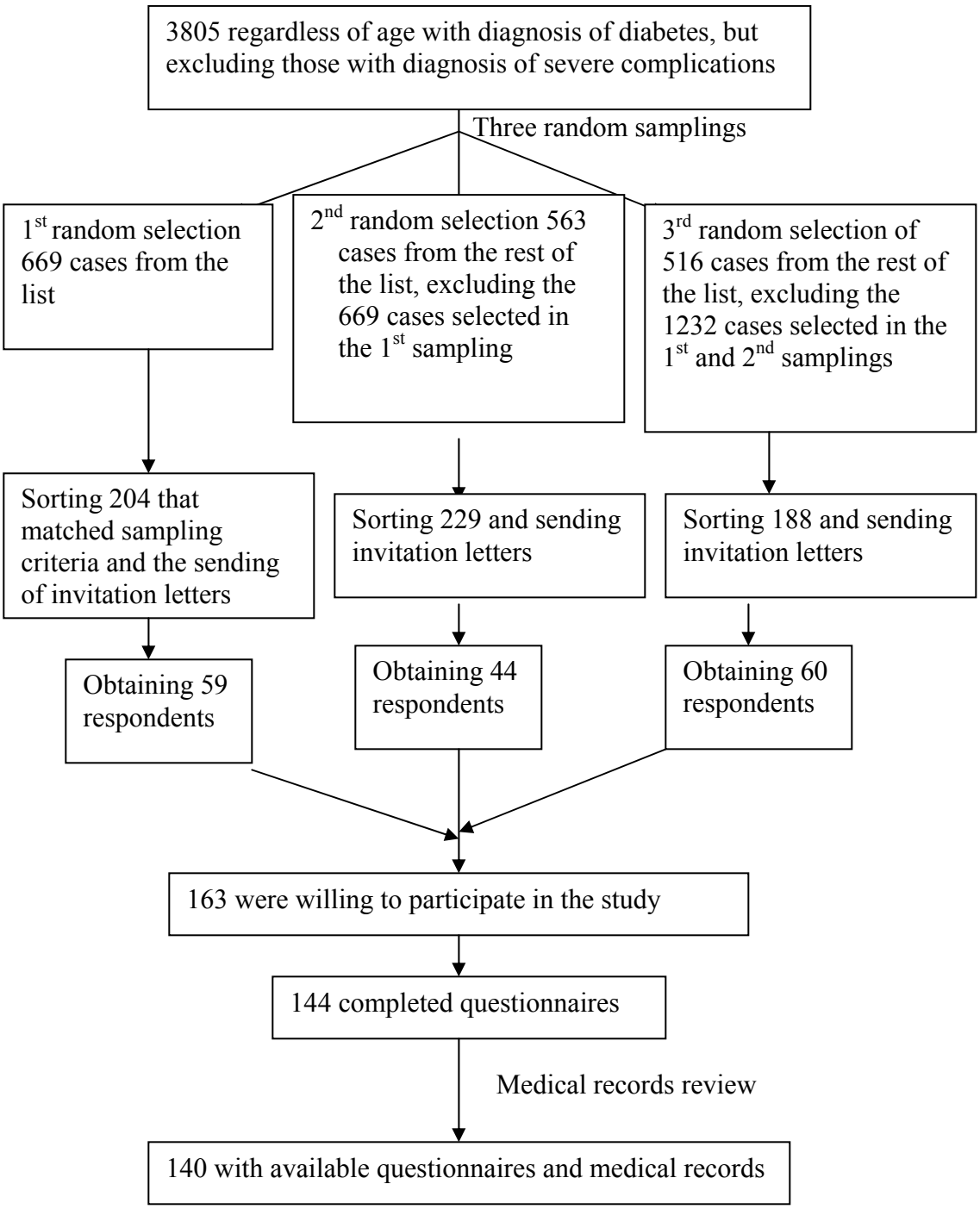


Figure 2. Sampling procedure

Procedure for Data Collection

This study was conducted at the outpatient diabetes clinic of the Buddhist Tzu-Chi Hospital in Hualien, Taiwan. The investigator used the following procedures to collect the data

1. All subjects who were willing to participate in the study were mailed a packet of questionnaires to be self-administered or to complete a telephone or face-to-face interview. The subjects who were literate received a packet of questionnaires with a consent form (Appendix B) and were asked to return the questionnaires and the consent form to the investigator. For those who were willing to participate but were illiterate, the investigator made an appointment with them either in the diabetes education room when they visited the clinic, at their home, or through telephone interviews, all at the participant's convenience. The signature for the consent form for illiterate participants was obtained when participants returned to the clinic or through a home visit.
2. The questionnaires took the participant a total of about 45 minutes to complete.
3. To increase the return rate in the mailing group, a reminder letter with a replacement survey questionnaire was sent to each literate participant two weeks after the packets were first distributed, in case the questionnaires were lost or misplaced. The reminder letter encouraged participants who had not yet responded to complete and return the questionnaire as soon as possible. The investigator also mailed a thank you card with a gift to show her appreciation to each participant who returned a completed survey.

4. To decrease the chances of questionnaires being returned with missing data, the participant was asked for permission for the investigator to telephone if she had any questions about the subject's response.
5. After obtaining the consent form, the investigator reviewed participants' medical records to obtain their diabetes-related clinical examination data over the past year (2002) for evaluation of professional performance and the outcome indicators of diabetes care. The clinical examination data included diabetes-related or non-diabetes-related comorbidities, eye-checkup information, blood tests for cholesterol (TCH), triglyceride (TG), and glycosylated hemoglobin (A1C), and a urinary test for microalbumin. The Diabetes Professional Performance Checklist was used to collect the clinical examination data and to record the information about diabetes education the patient received.

Pilot Study

Prior to preparation of the dissertation proposal, the investigator conducted a pilot study in Hualien, Taiwan. The purpose of the pilot study was to explore how diabetes professionals and patients tended to characterize ideal quality diabetes care, their perception of the current state of diabetes care, and the factors that influence the quality of diabetes care, as well as to guide selection of variables for the proposed dissertation study and to test study procedures. Professional participants included 4 physicians, 7 nurses, and 2 dietitians. Their work sites included one primary care clinic, one public health station, and the medical center in Hualien. Two focus groups (one nurses' group and one group comprised of a public healthcare team) and five individual interviews of

professionals (3 physicians and 2 dietitians) were conducted to explore their views about the quality of diabetes care in Hualien. Two patient focus groups with a total number of 10 participants were also conducted to explore their perception of diabetes care.

Participants were asked about the current quality of diabetes care, what they saw as ideal quality of care, and barriers to quality diabetes care. The interviews were recorded on audiotape and then transcribed. Using qualitative analysis (Khunti, 1999), factors influencing the quality of diabetes care from the professional's perspective were categorized into three dimensions: patient characteristics, community environment, and medical environment. Patient participants evaluated the quality of care largely in terms of the performance of professionals and especially the extent to which the health care providers were thought to be genuinely concerned with them, as well as the treatments that were prescribed, especially the extent to which they were thought to be tailored to each individual patient's condition.

Professionals identified age, ethnicity, education, economic status, work time and place, and gender as especially important patient characteristics that have an impact on the quality of diabetes care. The majority of diabetes patients in Hualien are not well-educated. Furthermore, many aborigines have maintained their traditional food habits of consuming high-fat meat and alcohol. The community environment includes health resources and social support. Family support and work time and place were reported as barriers for patient adherence to diet, self-monitoring of blood glucose, and insulin-injection regimens. Family is the most important social support resource in the culture of the rural area. However, the professional participants in the pilot study stated that family

members were rarely involved in patients' diabetes education. Working times and places were unstable, especially for those working in mountain areas. Patients who were educated about diet control described difficulties involved in the selection of appropriate food because of the lack of nutritional labels and the inconvenience associated with diet control. Medical environment factors, the structure and process of care, were frequently reported to have an impact on quality of care. Lack of integrated diabetes care, lack of manpower for diabetes education, and insufficient professional knowledge about diabetes treatment in primary care were identified as the most salient factors. Crowded diabetes subspecialty clinics, lack of interdisciplinary cooperation, inadequate referral systems, and unrealistic self-care regimens were also highlighted. Professionals pointed out the need for improvement in professional education, diabetes care guidelines, patient-professional relationships, interdisciplinary collaboration, and the referral system. Adequate support from the medical center administrator was also seen as being of especially critical importance.

The pilot study reported specific problems and suggestions identified by healthcare professionals and patients as important to the quality of diabetes care in Hualien. These qualitative findings highlight the importance of attending to patient demographic characteristics, community health and social support, and the structure and process of health care in improving diabetes care quality, as well as guiding the selection of variables for this dissertation.

Instruments

Based on the results of the pilot study and Donabedian's framework of quality of care, the quality of diabetes care was assessed by measuring technical diabetes care and management and interpersonal care received by study participants during the past 12 months. Participant medical histories and demographic data were also collected. Data were collected from two sources: patient self-reported questionnaires and medical records. A description of variables and their categories and measurement of each concept in this study are listed in Table 3.5 and 3.6. (page 121-123). The four questionnaires

- Diabetes Personal Data Sheet
- Patient Perception of Diabetes Care Quality Questionnaire
- Summary of Diabetes Self-Care Activities Questionnaire
- WHO Quality of Life Questionnaire Brief Version

and the specific medical record data to be obtained are described below.

Questionnaire 1. Diabetes Personal Data Sheet

Patients' personal information data include demographic data and diabetes-related information (Appendix C). The demographic data include gender, age, highest level of education obtained, ethnicity, occupation (working or pensioned) and information related to work time and place, religion, insurance, and marital status and/or cohabitation. The diabetes-related data include length of time since diagnosed with diabetes, self-known diabetes comorbidities and non-diabetes comorbidities, pharmacological status, self-reported average fasting plasma glucose over the past year, recent blood glucose (pre- or post-prandial), and A1C. Demographic and diabetes-related information was used to

describe the participants in the study. Self-reported biomedical data were compared to medical record data to measure the accuracy of patients' self-awareness of their diabetes medical status.

Measurement of Structure of Diabetes Care

Quality of diabetes care can be evaluated in terms of structure, process, and outcome. In this study, diabetes professional characteristics were viewed as a part of the structure of care. These data included health care institution characteristics and physician specialty. The health care institutions (hospital, private primary care clinic, or public health station) and the physicians from which the participants received care were identified in accordance with subject responses to the Patient Perception of Diabetes Care Quality Questionnaire (described below). Participants were asked about which health care settings they usually visited and the physician's specialty (diabetologist or not). Physician specialty was categorized as diabetologist or non-diabetologist. If the participant could not identify his or her physician's specialty, the investigator categorized them by checking their specialty with the Hualien County Health Bureau. The investigator calculated the characteristics of health care institution scores with the score for the diabetes care accreditation level of the institution, the number of disciplines available for diabetes care, and the number of disciplines with certified diabetes educators (see the detailed in Table 3.1). The Taiwanese Association of Diabetes Educators (TADE) has developed criteria for diabetes care institute accreditation that includes four levels: diabetes care center, diabetes education classroom, diabetes care clinics I and II (scored as 4, 3, 2, and 1 points, respectively). Diabetes care disciplines

include physicians, dietitians, and nurses who are available to provide diabetes care. The Hualien County Diabetes Shared Care Network started to issue certificates to diabetes educators in early 2002. The total scores of Health Care Institution Characteristics range from 1, in the primary care clinic setting with one general practitioner and without any other diabetes care team member, to 10 in the diabetes care center with members of all three disciplines being certified diabetes educators. However, the scores range only from 1 to 9 in this study because there was no diabetes care center in Hualien. Professional characteristics were assessed based on records of the Hualien County Health Bureau in the year prior to data collection.

Table 3.1. Scoring of health care institution characteristics

Item	Scoring
1. Level of diabetes care institute accreditation certified by Taiwan Association of Diabetes Educators and Department of Health, executive Yuan, Taiwan	1. Diabetes care center 4 2. Diabetes classroom: 3 3. Diabetes clinic I: 2 4. Diabetes clinic II: 1 5. None: 0
2. Number of diabetes care disciplines	Physician: +1 Nurse: +1 Dietitian: +1
3. Number of certified diabetes educators issued by Hualien Diabetes Shared Care System	Physician: +1 Nurse: +1 Dietitian: +1

Measurement of Process of Diabetes Care

The process of care was assessed by obtaining data regarding the interpersonal and technical care that patients received. Interpersonal care refers to patient-professional relationships. Technical care refers to professional performance and the organization of the health care system. The organization of the health care system includes how professionals and resources are integrated to deliver patient care. Organization enhances accessibility and continuity of care through collaboration between patients and professionals, and among disciplines and health care systems. Patient-professional relationships, continuity of care, referrals among professionals of different disciplines and between the health care system and the community, and diabetes education received by patients was assessed by the Patient Perception of Diabetes Care Quality Questionnaire (described below).

Questionnaire 2. Patient Perception of Diabetes Care Quality (PPDCQ)

The investigator developed the PPDCQ subscales (Part I in Appendix D) to measure continuity of care, patient perception of patient-professional interaction and how much they were satisfied with this interaction, accessibility to diabetes care, referrals among professionals in different disciplines in the system, and referrals between the system and the community. All participants were asked about their experience with respect to the diabetes care that they received as a result of clinic visits over the past year.

Patient satisfaction with professionals has a lot to do with a patient's perception of the level of collaboration between patient and care providers. Enhancing patient-professional relationships is likely, therefore, to enhance the patient's willingness to

continue visiting the same professional so as to obtain continuity of care. Sufficient time for consulting is also important to the relationship. One item asked participants the average consulting time that they received when they visited the diabetes clinic.

Patient satisfaction with professionals Scale (PSPS)

The patient satisfaction with professionals scale (Part I B in Appendix D) is part of the PPDCQ questionnaire. The PSPS includes three subscales. The content consists of two parts: patient's perception of interaction with professionals, and their satisfaction with the care professionals provide. Components of patient-professional interaction include the extent to which the patient received clear information, tailored diabetes treatment and education, and concern and respect from professionals. The other part included five items inquiring about patient satisfaction with care in the clinic, including the care provided by physicians, nurses, dieticians, administrative staff, and overall diabetes care. The three subscales, therefore, included items referring to patient interactions and satisfaction with physicians (5 items), nurses (4 items), and dietitians (4 items), respectively. All potential rating categories range from never to always (1 to 5 points). The potential subtotal scores for subscales of physician, nurse, and dietitian ranged from 6-30 to 5-25 and 5-25, respectively. Total scores of patient' satisfaction with professionals ranged from 16 to 80. The higher the score, the more satisfied the patient. Two additional items asked whether patients received care from nurses and/or dietitians.

The internal consistency for the PSPS whole scale and subscales (physician, nurse, and dietitian) were examined with Chronbach's α coefficients, resulting in .91 (N=37), .87(N=135), .87 (N=67), and .81 (N=61), respectively. Because only 37

participants completed all subscales of the PSPS, the score for satisfaction with physicians was used as the measure for the variable of professional performance.

Facilitation of Professional-Patient Relationship

Professional-patient relationships can be facilitated by continuity with respect to where and from whom patients receive care. Three items describe the continuity of care provided by the same physician. One is concerned with how often the physician made an appointment in advance in order to encourage the patient to return to the clinic. Another is concerned with the length of consulting time for each visit. The third item gauges how often physicians checked the subject's diabetes passport. Scores range from 1 to 5 points for each item. The potential scores of continuity of care range from 3 to 15. The standardized alpha coefficient of the scales in the study was .54 (N=139).

Interdisciplinary and Interorganizational Collaborations

The geographical shape of Hualien is long and narrow, with major medical resources concentrated in the north of the county. Many patients who visit the medical center from areas in the south have a long way to travel. To provide data about patient access to diabetes care, participants were asked about the length of time required for travel when they visited the diabetes clinic.

Interorganizational and interdisciplinary collaboration can facilitate accessibility to diabetes care. Patient accessibility to diabetes care is likely to be enhanced by referrals either between the community health care system and diabetes specialists or facilities specializing in diabetes-related examinations. Patients were asked whether referrals between the hospital and community clinics, such as primary care clinics or clinics that

are part of public health stations, were made by the physician they usually visit. Participants were also asked about whether the physician had referred them to other disciplines for diabetes education, including nurses and dietitians. The home visits or phone consultations that patients received for diabetes care also reflected collaboration in the extension of care from the clinic to the community. Each referral, either to another discipline or among medical care institutions in the community, or each service provided through a home visit or telephone consultation counted 1 point; the potential score, therefore, ranged from 0 to more than 6. The alpha coefficient of the scale of organizational collaboration was .31.

The PPDCQ questionnaire also contains nine items regarding specific educational content provided by professionals. A pretest of the PPDCQ was conducted prior to data collection. Ten diabetes patients in the clinic of Tzu-Chi Hospital were asked to complete the PPDCQ questionnaire and provide their feedback regarding readability and understandability, as well as the extent to which the questionnaire accurately reflected their perceptions of the process of care. Reliability of PPDCQ subscales is provided in Table 3.4.

Questionnaire 3: Summary of Diabetes Self-Care Activities (SDSCA)

The Summary of Diabetes Self-care Activities Questionnaire (SDSCA) was used to measure patients' diabetes self-care activities in this study (Toobert & Glasgow, 1994). Some questions in the SDSCA questionnaire were developed by the Rand Corporation based on a large-scale project in the United States (Toobert et al., 2000). The first version of the SDSCA questionnaire was used by Schafer et al. and Glasgow et al. and revised by

Toobert and Glasgow (1994). Toobert and colleagues (Toobert et al., 2000) revised the questionnaire according to the results of seven studies. The revised items were selected based on several criteria that considered consistency, variability, stability, validity, sensitivity to change, ease of scoring, and ease of interpretation (Toobert & Glasgow, 1994; Toobert et al., 2000).

The latest version of the SDSCA questionnaire consists of 11 items and 14 additional questions that may be used in interpretation of the results. Toobert et al.(2000) recommended excluding the medication scale in the revised version because of its strong ceiling effect in previous studies. This scale is composed of five dimensions of self-reported diabetes care based on the purposes of self-management, including glycemic control and reduction of risk factors of diabetes complications. These dimensions are diet (4 items), exercise (2 items), self-monitoring of blood glucose (2 items), foot care (2 items), and smoking cessation (1 item). In addition, the revised SDSCA scale also includes self-care recommendations received from health care providers for each dimension. Three items of activities related to taking medication are also included in the revised SDSCA.

Several studies have provided reliability and validity data for the original SDSCA (Toobert & Glasgow, 1994; Toobert et al., 2000). A panel of experts provided content validity data during initial scale development. The SDSCA has been probably the most widely used self-report instrument for measuring self-care activities, and also has undergone various modifications (Toobert et al., 2000). Toobert and colleagues (2000) revised the SDSCA and revised a new version for the SDSCA questionnaire according to

the findings of seven studies that used the questionnaire. The average of inter-item correlations of the SDSCA questionnaire was greater than .5. The correlations between subscales and criterion variables for each area of self-care regimen were found to be significant and provided evidence of the validity of this measure (Toobert et al., 2000).

The SDSCA was selected for this study because of its short, easy to respond to questions based on seven-day recall. The seven-day scale is considered to be appropriate for administration to the diabetes population in Taiwan, with more than 50% of diabetes sufferers having low education levels (<6 years) (Chuang et al., 2001). The rating categories that use number of days of self-care activities performed within one week is easy to respond to for this population.

After receiving permission from the author to translate and use the SDSCA questionnaire, the researcher translated the SDSCA into Chinese. The Chinese version was blindly back-translated by a Chinese-Taiwanese who has a master's degree in English. A native English speaker was invited to check the congruence between the original and the back-translated English version. The investigator revised and re-translated those items accordingly.

Following translation, a panel of experts including two physicians, two dietitians, and two nurses was convened to review the questionnaire to see whether the SDSCA items were congruent with recommended self-management in Taiwan. One item related to soaking feet was deleted because it is not common for patients to soak their feet in Taiwan.

Ten patients were recommended by the nurse in a diabetes clinic of Tzu-Chi Hospital in Hualien, to pretest the Chinese version of the SDSCA. These patients were asked either to self-administer the questionnaire draft or to respond when the questionnaire was read aloud. When the patients completed the questionnaire, the researcher checked with them to see whether or not the answer choices were seen as appropriate and whether or not patients felt embarrassed by answering the questions. One item that asked patients about healthy food was revised so as to ask them about balanced diet, in order to improve language understandability (Part II of Appendix D).

After these modifications, 34 patients were invited to participate in the pilot study of the SDSCA questionnaire when they were visiting diabetes clinics or family medicine clinics in Tzu-Chi Medical Center. The informed consent and the phone number were collected from selected patients directly after approval of the study by the Nursing DRC and IRB of the University of Texas at Austin. The participants were administered the questionnaire one-on-one or as a group in the diabetes education room of the medical center. The responses from the participants who were illiterate were collected by interview. One participant's data set was excluded because of many missing items. The α coefficient of internal consistency reliability was .48, .59, .79, and .92, and .50 respectively, for the whole scale and the diet, exercise, self-monitoring of blood glucose, and foot care subscales. When inspecting the data, it was noted that only 19 participants had completed the diet subscale because most patients could not understand the amount of a serving of vegetables and fruit and left the answer blank. In addition, most patients did not self-monitor blood glucose levels and that made the inter-item reliability of the

subscale very high (α = .92), but the mean score of the subscale was very low (M=1.32, SD=1.39). Furthermore, most people did not receive education about foot care. However, respondents implemented one of the foot care activities very well because of its familiarity in Taiwanese culture, but did not carry out another activity because they had not received related education.

The results of the pilot study showed that the content of education received varied greatly among participants. Based on recommendations of the ADA and the NHIB in Taiwan, certain self-care activities have been seen as necessary for better control of diabetes. Therefore, the investigator decided to retain all eleven items of SDSCA questionnaire irregardless of the extent to which patients had received education about self-care activities from professionals. Diabetes patients are assumed to self-manage their disease when they incorporate the recommended self-care regimen into their daily life activities. The extent to which patients received adequate self-care information undoubtedly has an influence on patient adherence to self-care activities, whether the source of the information be from professionals or lay persons. Therefore, this study examined patient adherence to self-management in terms of the appropriate diabetes self-care activities recommended. Participants were asked whether they were instructed in relevant care regimen activities and the sources from which they received information. All items of the SDSCA questionnaire were administered in the study, including the medication subscale that Toobert et al. recommended be excluded because of a ceiling effect found for the original medication subscale. Medication items were modified for this study to ask participants more detailed questions about how they adhered to their

ordered medication regimen over a one-week period. In addition, an explanation for one serving with one dish was added to the item about vegetables and fruit. Finally, fifteen items composed the scale for measurement of patient adherence to self-care regimens. The potential total score of the questionnaire ranges from 0 to 105. The Alpha coefficient for the SDSCA was .71 (N=137). The total score of the SDSCA questionnaire was used as the measure of the outcome variable patient adherence to self-care regimen.

The SDSCA was administered for a second time two weeks after the first administration. Test-retest reliability was evidenced by the correlation between the two administrations. The correlation coefficient was .71 (N=40, $p < .01$).

Questionnaire 4: Quality of Life (WHOQOL-Brief)

The World Health Organization Quality of Life Taiwan Brief version (WHOQOL-Brief-TAIWAN) was used in this study to measure patients' subjective perception of quality of life as one outcome indicator of quality of care. The WHOQOL-Brief-Taiwan consists of 26 original items of the WHOQOL-Brief and two additional items related to Taiwanese culture (Part III of Appendix D). Items of the WHOQOL-Brief questionnaire, which was pilot tested cross-culturally with 11,275 respondents from 20 centers of 18 developed and developing countries using 19 languages by 1996, were selected and modified from 100 items of the original World Health Quality of Life questionnaire (WHOQOL-100) (Yao, 2001). The WHOQOL-Brief-Taiwan questionnaire contains four domains, twenty-six facets, and one item for each facet: physical health (7 items), psychological health (6 items), social relationship (4 items), and environment (9 items). The other two items are used to test overall perceptions of quality of life and

general health. Participants were asked to self-report their subjective perception of their quality of life in the month prior to completing the questionnaire. A five-point Likert scale is used in the questionnaire. The higher the score obtained, the higher the quality of life perceived by the respondent.

In a field test of the WHOQOL-Brief-Taiwan with 1017 Taiwanese outpatients who visited clinics in four teaching hospitals in Taiwan, the questionnaire demonstrated satisfactory internal consistency with a Cronbach's α coefficient of .91 for the entire questionnaire and a range of .68 - .77 for each domain. Test-re-test reliability was demonstrated with Pearson correlations (N=142, r = .75-.80 for each domain, r = .41-.79 for each item). Content validity was estimated with Pearson correlation coefficients of each facet within each domain (r = .53-.78, p< .01) and the correlation between domains (r = .51-.63, p< .01). In Yao et al.'s study, participants who were diagnosed with diseases obtained lower mean scores in every domain of the questionnaire when compared with participants without diagnosis of disease (N=212). Diabetes participants (N=39) had lower mean scores in the physical, psychological, and social domains when compared with the mean scores of the total sample diagnosed with diseases (N: 840). The WHOQOL-Brief-Taiwan is a reliable and valid instrument for measuring quality of life. The Cronbach's alpha coefficient was .85 (N=35) in the pilot test and .93 (N=105) in the major study.

Measure for Diabetes Professional Performance Checklist (DPPC)

Diabetes professional performance includes preventive monitoring (M-DPPC) and diabetes self-management education (E-DPPC). Data about preventive monitoring were collected from a review of patient medical records. Based on the guidelines found in the diabetes care service package posted on the website of the Taiwan Bureau of National Health Insurance (BNHI) and the measures employed for the study of diabetes adult patients in the Diabetes Quality Improvement Program sponsored by ADA ("NCQA/ADA Diabetes ", 2002), the investigator used a panel of experts to select appropriate items and subscores for measuring diabetes professional performance in Taiwan. Seven dimensions of preventive monitoring were selected (Table 3.2). The risk factors of diabetes complications were measured through evaluation of blood tests for A1C, blood glucose, nephropathy assessment (serum creatinine, urine protein, and microalbumin), lipid profile (total cholesterol, LDL-C, HDL-C, and triglyceride), blood pressure check-up frequency, foot examination, and ophthalmoscopic examination. The potential subtotal maximum score for each dimension is 10 points. The maximum score for preventive monitoring is 70 points.

Table 3.2. Measure for Preventive Monitoring Professional Performance (M-DPPC)

Item	Frequency or Response	Data Source	Item score	Subtotal score
1. A1C	1 time/yr 2 time/yr 3 time/yr 4 time/yr	MR*	2.5 5 7.5 10	10
2. Blood glucose (AC or PC)^	1 time/yr 2 time/yr 3 time/yr 4 time/yr	MR	2.5 5 7.5 10	10
3. Foot examination (PPDCQ 37)	Yes @	PSR**		10
4. Nephropathy assessment: Serum creatinine& Urine analysis& Microalbumin (with or without above)	1 time/yr	MR	5& 5& 10	10
5. Lipid profile: Total Cholesterol LDL-C HDL-C Triglyceride	1 time/yr	MR	2.5 2.5 2.5 2.5	10
6. Blood pressure frequency	At least 2 3-4 time/yr	MR	5 10	10
7. Ophthalmoscopic examination (PPDCQ 4-2)	1 time/yr	MR+PSR	10	10
Total			70	70

* MR: Medical records

** PSR: Participant Self-Reported (From SDSCA and PPDCQ)

^ AC (pre-prandial) and PC (post-prandial) counted for 1 if tested on the same day

@ Examination taking off shoes and socks

& If urine protein positive, then either serum creatinine or urinalysis received a score of 10

The same process was used to assess professionals' performance in the area of diabetes self-management education (E-DPPC). These data were collected from the patients' self-reported Summary of Diabetes Self-Care Activities and Patient Perception of Diabetes Care Quality Questionnaires. Items of E-DPPC and the corresponding items that were collected from each questionnaire are presented in Table 3.3. Five dimensions make up the assessment of diabetes education performance: tobacco status and counseling (10 points), diet education (10 points), exercise education (10 points), instructions about foot care (10 points), and instruction about self-monitoring of blood glucose (10 points). Detailed items and score distribution are shown in Table 3.3 from item number 8 to 12. The potential maximum subtotal score for diabetes education performance is 50 points.

The DPPC consists of items regarding preventive monitoring (DPPC-M) and preventive education (DPPC-E). Alpha coefficients for the DPPC, DPPC-M, and DPPC-E were .71, .74, and .61, respectively (N=140).

Table 3.3. Measure for Preventive Education Professional Performance (E-DPPC)

Item	Frequency or Response	Data Source	Item score	Subtotal score
8. Tobacco status & counseling: Asked about tobacco status (SDSCA 6R) Counseling or referral # (SDSCA 7R)	Yes	PSR**	5 5	10
9. Diet education: Avoiding sweets (SDSCA 1R [f]) Low fat (SDSCA 1R [c]) Vegetables and fruits (SDSCA 1R [e]) Diet evaluation and modification (SDSCA 1R [b]) Lose weight if needed (SDSCA 1R [d])	Annual	PSR	2 2 2 2 2	10
10. Exercise education: Encouraging exercise frequently (2R [a]) Instructing how to exercise (2R [b], [c], or [d])	Yes	PSR	5 5	10
11. Instruction in foot care: Self-examination of feet (SDSCA 5R [a]) Adequate foot wear (5R [d])	Yes	PSR	5 5	10
12. Instruct self-monitoring BG (SDSCA 3R [a])	Yes	PSR	10	10
Total			50	50

** PSR: Participant Self-Reported (From SDSCA and PPDCQ)

If non smoking, then the scores are also added.

The investigator and her assistant randomly selected five sets of medical records and rated these individually using the Medical Record Checklist (Appendix E) that contained medical records related to the content of preventive monitoring in the Diabetes Professional Performance Checklist. The assistant rated all 140 patient records and re-rated 14 randomly selected records to obtain percentage agreement for the evidence of intra-rater reliability. The percentages of inter-rater and intra-rater agreement were 93.1% and 92.5%, respectively. The items showing rater disagreement were missing data from those tests with higher frequency such as blood pressure, but did not influence overall scores of the MPPC.

Summary of means, standard deviations, ranges, and reliability coefficients for the PSPS, SDSCA, QOL, MDPPC, organizational collaboration, facilitation of patient-professional relationships, and institution characteristics in the study are presented in Table 3.4.

Table 3.4. Means, standard deviations, ranges, and reliability coefficients of predictor measures

Measures	Number of Items	N	M	Minimum	Maximum	SD	Reliability coefficient (Standardized item α)
QOL	28	105	93.68	38.00	135.00	17.90	.94
Physical health		135	22.90			5.17	.79
Psychological		134	19.16			4.61	.79
Social relations		116	13.80			2.58	.66
Environmental		135	29.96			6.22	.84
SDSCA	11	140	20.10	3.50	38.00	8.35	.71
DPPC	12	140	63.49	4.50	112.50	22.66	.71
				Inter-rater	reliability	(agreement)	93.1%
				Intra-rater	reliability	(agreement)	92.5%
DPP-Monitoring	7	140	38.88	0	67.50	17.27	.74
DPP-Education	5	140	24.72	0	50	11.97	.61
PSPS	18	37	74.80	10.00	90.00	10.04	.91
Physician	6	135	24.75	6.00	30.00	5.09	.88
Nurse	5	67	20.28	9.00	25.00	3.92	.87
Dietitian	5	61	19.34	11.00	25.00	4.21	.81
Facilitation of p-p relation.	3	139	10.97	5	15	2.22	.54
Institution characteristics	3	140	7.31	1	9	2.38	.80
Organizational collaboration	3	140	1.11	0	5	1.15	.31
Age		140	57.87	28	75	10.04	NA
Year of Education		140	6.89	0	16	4.38	NA

Table 3.5. Variables of Patient Characteristics

Variable	Categories
Gender	Male Female
Age	Age as of January 1, 2003
Education Level	Years of education
Ethnicity	Non-aborigine Mainlander and Minan Hakka Indegenous tribes Amy Ataya Bunon
Work Status	No Employed Regular work schedule and location Irregular work schedule and location
Marital Status	With partner (Married/Cohabit) Without partner (Single/Divorced/Separate)
Diabetes duration	1 point: < 2 years 2 points: 2-5 years 3 points: 5-10 years 4 points: >10 years
Type of Treatment	Insulin treatment Non-insulin treatment (on oral medication or on diet only)

Table 3.6. Measures of organizational variables in this study

Concept	Variable description	Measurement
Structure Variable Professional factors: Professional characteristics	Diabetes-related characteristics of healthcare institution and professional specialties	Data are in the Patient Perception of Diabetes Care Quality (PPDCQ) Questionnaire (1) **Diabetes-related characteristics of healthcare institution** in terms of institute certified status, number of diabetes health care team members, and their certification. (2) **Professional specialty**: diabetes specialist or non-diabetes physician
Process Variable 1: Professional factors: Professional performance	1.Professional's adherence to guidelines recommended (1) Diabetes preventive monitoring (2) Diabetes education	1. **Diabetes Professional Performance measure** (DPPC) (1) Preventive monitoring: Frequency during year of examinations and blood tests (2) Patient received diabetes education (Yes/No)
Process Variable 2 Patient-professional relationships	2. Patient satisfaction with health care providers in diabetes clinic.	2. **Patient Satisfaction with Professionals** Scale (PSPS) in the Patient Perception of Diabetes Care Quality (PPDCQ) Questionnaire

(table continues)

Table 3.6. (Continued) Measures of organizational variables in this study

Concept	Variable description	Measurement
Process Variables 3 & 4: Organization of the health care system factors	The configuration of health care system 3. Facilitation of professional-patient relationships. 4. Interdisciplinary and interorganizational collaboration to facilitate access to care.	Included in the PPDCQ questionnaire 3. **Continuity**: Received consulting time, registration in advance, use of diabetes mellitus passport 4. **Organizational collaboration**: Number of referrals to other disciplines and to the community, number of home visits and phone consulting.
Outcome variable 1: Glycemic control	Glycosylated hemoglobin	Level of glycosylated hemoglobin (A1C)
Outcome Variable 2: Patient adherence	Carry out appropriate diabetes self-care activities.	Summary of **Diabetes Self-Care Activities** Questionnaire (SDSCA) (Toobert & Glasgow, 1994)Contains: medication, diet, exercise, self-monitoring blood glucose, foot care, and smoking.
Outcome variable 3: Quality of life	Self perception of general health status and well-being	World Health Organization Quality of Life-Brief Taiwan Version (WHOQOL-TAIWAN) (Yao, Chung, Yu, & Wang, 2002) consists of 4 domains: Physical health, psychological, social relationships, and environment domains.

Data Analysis

Research questions and analyses of the study are presented below:

Research questions

1. What are the patient outcomes (patient adherence, perception of quality of life, and glycemic control) of diabetes care received in the previous year?
2. What levels of diabetes preventive care have patients with diabetes received in the previous year?
3. What are the relative contributions of organizational factors (professional-patient relationships, professional factors [professional characteristics and professional performance], organization of health care system [facilitation of professional-patient relationship and interdisciplinary and interorganizational collaboration]) and patient characteristics (age, gender, education, ethnicity, occupation, marital status, diabetes duration, and comorbidity) to quality outcomes of diabetes care (patient adherence to self-care regimen, perception of quality of life, and glycemic control) in Hualien, Taiwan?

SPSS 10.0 computer software was used for all statistical analyses. The statistical analyses were modeled as follows:

1. Descriptive statistics was used to describe demographic characteristics of study participants, outcome variables, and structure and process variables with frequency, mean, standard deviation, range, and distribution characteristics.

2. Cronbach's α coefficient was used to examine the internal consistency of all measurements in this study including the PSPS questionnaire, WHOQOL-Brief Taiwan version, the SDSCA, the MDPPC, diabetes care institution characteristics, organizational collaboration, and facilitation of patient-professional relationships scales. Pearson's product-moment correlation coefficient was used to examine test-retest reliability of the PSPS and SDSCA questionnaires. Percent agreement analysis was used to measure inter and intra-rater reliability of Medical Record Checklist.
3. Relationships among continuous variables (including age, education, length of time since diagnosis, comorbidity, professional-patient relationships, professional characteristics of health care institution, diabetes professional performance of preventive care, professional-patient relationship enablers, interorganizational and interdisciplinary collaboration, adherence to self-care, quality of life, and A1C) and dichotomized variables (gender, type of treatment, ethnicity, occupation, and physician specialty) were tested with correlations analysis. Bivariate analysis was also used to compare means for all variable categories.
4. Stepwise multiple regressions were used to identify a combination of factors influencing diabetes adherence, quality of life, and A1C, respectively.

Consent and Protection of Participants

Participants were recruited based on their willingness to participate in the study. Thirty outpatients with diabetes were invited by the nurses of TCH to participate in a pilot test of the PPDCQ questionnaire. The PPDCQ questionnaire and a cover letter

(Appendix F) were given to interested patients by clinic nurses. The nurses asked participants to place the completed questionnaires into a sealed box at the information desk of the clinic. This pilot test of the PPDCQ questionnaire was self-administered anonymously. In the main study, letters describing the study were mailed from the Director of the Diabetes Education Center to persons who met the sampling criteria. Each letter also contained a postcard that asked potential participants to return the postcard if they did not wish to be contacted. All study participants completed a packet of questionnaires either by receiving and returning them by mail or by completing a telephone or face-to-face interview. The consent form for the study is in Appendix B. Subjects who were literate received the packet of questionnaires and a consent form. They were asked to return the questionnaires and the consent form to the investigator by mail. For those who were willing to participate but were illiterate, a telephone or face-to-face interview was used to read questionnaire items to participants and record their responses. The signature for the consent form was obtained when these participants had their next clinical appointment or when they were interviewed in their homes. The investigator mailed thank you cards and a gift to show her appreciation to the participants who returned a completed survey.

Potential Risks

Potential risks to the participants were minimized through precautions taken with respect to data security. Confidentiality was and will continue to be maintained throughout and after the study. The investigator explained to the participants the purpose of the study and their right to withdraw from the study at any time if they did not want to

continue their participation. All medical, demographic and questionnaire data were labeled with a code number and kept in a locked file to ensure confidentiality.

Potential Benefits

The study has provided important information and may ultimately contribute to an improvement of the quality of diabetes care in Hualien, Taiwan. In addition, the patients involved may have gained additional understanding concerning the self-management of diabetes and may have appreciated the opportunity to express their views about how diabetes care in Hualien can be improved. The information participants provided is likely to contribute to improving the provision of diabetes care in this area in the future.

Summary

This chapter included a description of research design, population and sampling, procedures of sampling and data collection, the pilot study, and instrumentation. Strategies were presented for analysis of data to answer the study questions.

CHAPTER IV

PRESENTATION OF THE FINDINGS

Introduction

This chapter describes the results of this study. The first part describes the study sample and data collection sites. The second section describes reliability of study measures. The final section presents statistical analysis of the data and interpretation of the results of the study.

Description of the Sample

Characteristics of the Study Sites

The study was conducted in Hualien County of Taiwan and focused on diabetes services received by study subjects from January 1 through December 31, 2002. All subjects were patients seen at the medical center in Hualien in 2001 and were identified through medical center records. According to participant descriptions, the health institutions that they usually visited in 2002 included one medical center, one regional hospital, three district hospitals, eight public health centers, and sixteen private clinics. The first phase of a shared care system (professional education) had been implemented in Hualien prior to data collection. Three hospitals became certified as diabetes health care institutes by the Taiwan Association of Diabetes Educators (TADE) in 2001. One hundred and thirty eight certified diabetes educators (CDE) worked in these study sites, including fifty physicians, sixty-eight nurses, and ten dietitians. Their certifications were issued by the Hualien County Diabetes Shared Care Network in early 2002.

Table 4.1 Number of institutions with diabetes professional certificate in study sites

	Number of Physicians with CDE /number of institutions	Number of Nurses with CDE/number of institutions	Number of Dietitians with CDE/number of institutions
Medical Center*	11/1*	9/1*	2/1*
Regional hospital*	6/1*	5/1*	2/1*
District hospital	9/4 (1*)	28/4 (1*)	5/4 (1*)
Public health station	12/11	25/11	1/11
Private clinic	9/9	1/9	0/9
Total	50/26	68/26	10/28

* Certified Diabetes Care Institute

There were no common rules for medical referral in Hualien County. Medical care systems with higher levels of medical accreditation usually legislate their own referral systems in conjunction with other primary care systems.

Characteristics of the Sample

Characteristics of the sample include social-demographic and diabetes-related characteristics. One hundred and forty people comprised the sample.

Social-demographic characteristics

The summary of participants' socio-demographic characteristics is presented in Table 4.2. and Table 4.3. A majority of the subjects were female (60.7%, N=85; male: 39.3%, N=55). The average age was 57.9 (range: 28-75). Over half of the subjects were 60 years of age or above (52.2%, N=73). The ethnicity of the majority of the subjects was Holo (55.7%, N=78). The other participants included 27 aborigines, 26 Hakkas, and 9 mainlanders. The average number of years of education was 6.9 (0-16). More than half of

the participants (61.4%) had education levels of less than six years. Ninety-nine subjects (70.7%) were married or cohabitated, 28 were widows (20%), and 13 were single, divorced, or separated. More than half of the participants (58.6%, N=82) did not work. Fifty-eight participants were employed. However, sixty-seven people answered the question regarding their working characteristics. Thirty-nine were working in a regular schedule and location. Twenty-eight persons were working in an irregular schedule or location. Almost all of the subjects (99.3%, N=139) were enrolled in the National Health Insurance Program (NHI). Fifty-eight people (41.4%) had private health insurance in addition to the NHI program.

Diabetes-related characteristics

About forty percent of the participants (N=57) had been informed of their diagnosis of diabetes for more than 10 years, 25% for 5-10 years (N=35), 26.4 % for 2-5 years (N=37), and 7.9% for less than 2 years (N=11). The majority of participants (70.7%, N=99) were receiving treatment with only oral hypoglycemic medication. Ten percent (N=14) had been prescribed only insulin injections and 13.6% (N=19) were treated with both oral and injected medication. Eight participants were under only diet control.

Table 4.2. Frequency of patient characteristics information (N=140)

Item	Category	Frequency	%	M	Maximum	Minimum	SD
Gender	Male	55	39.3				
	Female	85	60.7				
Age	18-39	8	5.7				
	40-49	18	12.9				
	50-59	41	29.3				
	60-69	62	44.3				
	Above 70	11	7.9				
	Total	140	100.0	57.87	28	75	10.04
Highest level of education	No Education	21	15.0				
	Elementary School	65	46.4				
	Middle School	20	14.3				
	High School	26	18.6				
	College Degree	8	5.7				
	Years of Education		100.0	6.89	0	16	4.38
Ethnicity	Mainlander	9	6.4				
	Holo	78	55.7				
	Hakka	26	18.6				
	Aborigine	27	19.3				
	-Amis	11	7.9				
	-Ataya	9	6.4				
	-Bunon	7	5. 0				

(Table continues)

Table 4.2 (continued) Frequency of patient characteristics information (N=140)

Item	Category	Frequency	%
Mother language	Mandarin	65	46.4
	Holo	55	40.0
	Hakka	10	7.1
	Aborigine	9	6.4
Marital status	Unmarried/single	6	4.3
	Married/cohabited	99	70.7
	Divorced/separated	7	5.0
	Widow/Widower	28	20.0
Work status	No/retired	82	58.6
	Yes	58	42.4
	-Regular schedule and location	39	27.9
	-Irregular schedule and/or location	28	20.0
Health insurance	None	1	.7
	National	81	57.9
	National & private	58	41.4
Diabetes duration (years)	1-2 years	11	7.9
	2-5 years	37	26.4
	5-10years	35	25.0
	Above 10 years	57	40.0
Diabetes prescription	Oral medication	99	70.7
	Insulin injection	14	10.0
	Combination	19	13.6
	No medications	8	5.7

Table 4.3. Means, Standard Deviations, and Ranges of continuous patient characteristics variables

Item	Number	Minimum	Maximum	M	SD
Age	140	28	75	57.87	10.04
Education (Years)	140	0	16	6.89	4.38
Diabetes Complications Number	140	0	5	1.35	1.37
Total length of hospital stay (day)	40	1	195	19.84	34.44
Self-reported average AC	104	75.00	350.00	189.00	58.79
Self-reported average PC	47	100.00	459.00	240.47	84.64

About one-fifth of participants (19.3%, N=27) reported that they did not know whether they had diabetes complications or not. More than half of the participants (55%, N=77) reported that they had experienced at least one complication resulting from their diabetes. Reported complications were neuropathy 35.0% (N=49), nephropathy 24.3% (N=34), retinopathy 22.1% (N=31), heart disease 20.0% (N=28), foot problems 18.6% (N=26), and cataracts 15.7% (N=22) (see p.172, Table 5.1).

With respect to reported comorbidity, approximately one-third of the participants (34.3%, N=48) reported that they had other chronic diseases. Comorbidity included hypertension (40.7%, N=57), hyperlipidemia (29.3%, N=41), osteoarthritis (15%, N=21), and others, such as hepatitis, asthma, heart valve disease, etc. (19.3%, N=27). Forty-three participants reported that they had been hospitalized in 2002. Their average length of stay

was 19.84 days. Ninety-two persons (19.3%) reported that they did not have any other chronic disease.

The participants were asked to report their overall levels of blood glucose over the course of the year prior to data collection. Twenty-five participants (17.9%) responded that they did not know their levels. Among those who knew their levels, the average levels of pre-prandial and post-prandial blood glucose reported were 189.0 (N=104, range= 75.0-350.0) and 240.5 (N=47, range=100.0-495.0), respectively.

Descriptive Analysis of Data

This section presents the descriptive data of study variables. Means, standard deviations, ranges, and reliability coefficients of the variables of Diabetes Professional Performance (DPP), Quality of Life (QOL), Patient Satisfaction with Professionals (PSP), Healthcare Institution Characteristics (HIC), and organizational Collaboration (OC) are described.

Questionnaires data were examined for missing values, outliers, and skewed distributions. Because the missing values were diffuse and distributed among different participants and different items, every missing value in a domain of the WHQOL-Brief questionnaire was replaced with the subject's mean of the items within the domain. One subject had two missing values in the social relations domain of the questionnaire, and this subject's response was not included in the analysis. Besides the WHQOL-Brief questionnaire, other missing values were replaced with the subject's mean score of the series. In accordance with the suggestion of the originator of the SDSCA, therefore, the sum of the average scores of each of the questionnaire's six dimensions was used as the

outcome measure for diabetes self-care activities. In what follows, the variables of this study are described in two categories, outcome variables and predictor variables.

Outcome Variables

Outcome variables in this study include the level of A1C, Quality of Life, and Adherence to Self-Care. Their means, standard deviations, and minimum and maximum scores are shown in Table 4.4.

Level of A1C

The most recent A1C level for 100 participants were obtained in this study. Forty participants did not have their A1C level tested in 2002. The date of testing of A1C varied among the other participants. More than 50% of the participants received the most recent test before the end of August 2002. Others received the most recent A1C test from September to December of 2002. The average level of A1C was 8.27 (N=100, range= 4.0-14.3, SD=1.88). Based on ADA standards of medical care (American Diabetes Association, 2003), 70% of the participants for whom there were A1C data, A1C levels indicated that subjects' diabetes was not well controlled (N = 70, A 1C $\geq$ 7%. Relative mean plasma glucose is more than or equal to 170 mg/dl). Fifty-two percent (N=52) were in need of intensive treatment (A1C > 8%, relative mean plasma glucose level is more than 205 mg/dl).

Table 4.4. Means, standard deviations, ranges, and skewness of outcome measures

	Valid Number	M	Minimum	Maximum	SD	Skewness Statistic	Kurtosis Statistic
A1C	100	8.27	4.00	14.3	1.88	.567	.082
Quality of Life	139	52.95	23.25	77.32	9.58	-.553	.518
Physical health#	140	13.04	5.14	19.43	2.95	-.484	-.166
Psychological#	140	12.67	5.33	19.33	3.07	-.490	-.314
Social relations#	139	13.89	7.00	19.00	2.57	-.302	-.121
Environmental#	140	13.33	4.44	19.56	2.73	-.753	1.21
Self-care Activities* (Without medications)	140	20.10	3.50	38.00	8.35	.45	-.91
General diet	140	3.70	.00	7.00	2.95	-.113	-1.67
Specific diet	140	5.14	.00	7.00	1.64	-.573	-.500
Exercise	140	3.20	.00	7.00	2.60	.263	-1.335
SMBG[@]	140	.76	.00	7.00	1.70	2.588	6.171
Foot care	140	2.29	.00	7.00	2.64	.705	-.946
Smoking	140	5.01	.00	7.00	3.10	-.979	-1.004
Medications	140	6.04	.00	7.00	2.08	-2.246	3.616
Self-care Activities (All dimensions) *	140	26.13	4.0	44.5	8.84	.029	-.820

After transforming with 20 points for the domain

* Sum of means of all dimensions

[@] Self-monitoring of blood glucose

Diabetes adherence to self-care

A summary of the Diabetes Self-Care Activities Questionnaire (SDSCA) was used to measure participants' adherence to diabetes self-care activities, representing the variable adherence to self-care of the study. The SDSCA included seven dimensions: general and specific diet, exercise, self-monitoring blood glucose, foot care, smoking, and medications.

Among 140 participants, the dimension of medication presented the highest score with respect to self-care activities (mean= 6.04, SD= 2.08). About ninety percent of participants were under diabetes treatment with oral medication (N=118). Thirty percent had received a prescription for insulin-injection (N=33, 22.9%). Most participants demonstrated a high level of adherence to self-care to diabetes medications no matter which pattern of diabetes treatment was prescribed. The scores of this dimension represent a ceiling effect in the study.

The dimension with the lowest score among self-care activities was self-monitoring of blood glucose (SMBG) (N=140, M= .76, SD= 1.70), which, on the contrary, represented a floor effect. More than 75% of participants failed to test their blood glucose as often as once a week at home (N=106). About thirty percent of participants (N=43) smoked.

Self-care scores along dimensions of specific diet and smoking were high compared with other dimensions in this study, indicating good dietary action and not much smoking (M=5.14/ SD=1.64, M=5.01/SD= 3.09, respectively). However, scores along the dimension of foot care were lower than moderate (M=2.29, SD=2.64). The

potential total scores of diabetes self-care activities ranged from 0 to 49. The mean total scores for the self-care activities questionnaire were moderate at 26.13 (N=140, SD= 8.84, range=4.0-44.5).

Quality of Life

The WHOQOL-Brief questionnaire contains four domains that are related to personal perceptions of quality of life: physical, psychological, social relations, and environmental domains. According to the primary author's suggestion for the questionnaire, the obtained score of each domain was transformed by dividing by the number of items in the domain, and then multiplied by four in order to make the potential score range for each domain be 4 to 20. Thus, the potential total scores of the WHOQOL-Brief ranged from 16 to 80. The mean score of the sample, 52.95, was slightly above moderate, (N=139, Range=23.25-77.32, SD=9.58), which indicated that overall, participants had a slightly positive perception of quality of life. With the highest score (N=139, Mean=13.89, range=7.00-19.00, SD=2.57), the domain of social relations was found to be the most positive domain of quality of life perceived by the participants. The psychological domain resulted in the lowest score (N140, Mean=12.67, range=5.33-19.33, SD=3.07). The average scores of the physical and environmental factors were 13.04 and 13.32, respectively.

Diabetes Preventive Care

Preventive care, which is also referred to in this study as Diabetes Professional Performance, included two parts with respect to the health care that participants received from health care professionals over the year prior to data collection. One of these is

preventive monitoring for risk factors associated with diabetes complications and the other is preventive education for diabetes self-care.

The aspect of preventive monitoring consisted of laboratory data regarding the A1C level, blood glucose, nephropathy screening (microalbumin or serum creatinine and urinalysis), lipid profile (cholesterol, HDL-C, LDL-C, and triglyceride), the measure of blood pressure, foot examination, and eye check-up. The aspect of preventive education included instructions for tobacco counseling, diet, exercise, foot care, and the self-monitoring of blood glucose levels.

The data with respect to preventive monitoring were recorded on the basis of a review of medical records with respect to frequency. The data for preventive education were recorded and transformed from respondent questionnaires. Both were weighted as noted in the measure of Diabetes Professional Performance Checklist (DPPC) (Table 3.2 and 3.3). The potential scores for preventive monitoring (DPPC-M) and preventive education (DPPC-E) ranged from 0 to 70 and from 0 to 50, respectively. The frequency and mean scores of each item of the DPPC are presented in Table 4.5.

The mean for the total scores of the DPPC in the study was 63.49 (SD=22.66). The monitoring score was slightly higher than moderate (M=38.77, Potential scores=0-70, SD-17.27). Blood pressure measures showed the highest score with respect to preventive monitoring (M=8.36, SD=3.57). The lipid profile was resulted in moderate scores (M=5.20, SD=3.93). Blood glucose and nephropathy assessment showed higher than moderate scores (M=7.55 and 7.32, respectively). Foot and ophthalmoscopic examinations were found to have the lowest scores, 2.21 (SD=4.17) and 3.79 (SD=4.87),

respectively. About seventy-eight percent of the participants reported that their physicians had never checked their feet (N=109). More than sixty percent of participants had not received eye check-ups in the year 2002 (N=87).

With regard to the aspects of preventive education, the sub-item with the highest score was exercise education (M=7.04, SD=3.33). Most participants did receive instruction concerning the importance of diet and exercise (about 90%). The sub-item with the lowest score was instruction concerning foot care (M=2.79, SD=3.76). More than half of the participants (N=84, 60%) reported that no professionals had ever instructed them about foot care. A similar result was found in the sub-item self-monitoring of blood glucose (N=78, 55.7%). Eighty-two participants reported that they received instruction about the use of tobacco. However, more than 40% of participants reported that no professional had ever asked them about their own tobacco status (N=58). Twelve of 43 smokers had never been asked about their smoking status. Eighteen smokers had never been referred to receive smoking cessation counseling. The mean for total education scores was moderate (M=24.72, Potential score=0-50, SD=11.97).

Table 4.5. Frequency and mean scores for each item of preventive care (N=140)

Measure	Frequency	%	Min.	Max.	M	SD
Monitoring scores			.00	67.5	38.77	17.27
A1C			.00	10.00	4.34	3.57
Yes	100	71.4				
Never	40	29.6				
Blood glucose			.00	10.00	7.55	3.21
Foot examination			.00	10.00	2.21	4.17
Yes	31	22.1				
Never	109	77.9				
Nephropathy assessment			.00	10.00	7.32	3.95
Yes	99	71.7				
Never	41	29.3				
Lipid profile:			.00	10.00	5.20	3.93
Yes	99	70.7				
Never	41	29.3				
Blood pressure measure			.00	10.00	8.36	3.57
Yes	126	90.0				
Never	14	10.0				
Ophthalmoscopic exam.			.00	10.00	3.79	4.87
Yes	53	37.9				
Never	87	62.1				
Education scores			.00	50.00	24.72	11.97
Tobacco status & counseling			.00	10.00	3.86	3.71
Yes	82	58.6				
Never	58	41.4				
Diet education			.00	10.00	6.61	3.20
Yes	127	90.7				
No	13	9.3				
Exercise education			.00	10.00	7.04	3.33
Yes	126	90.0				
Never	14	10.0				
Instruction in foot care			.00	10.00	2.79	3.76
Yes	64	40.0				
Never	84	60.0				
Instruct self-monitoring BG			.00	10.00	4.42	4.98
Yes	62	44.3				
Never	78	55.7				
Total preventive care			4.50	112.50	63.49	22.66

Predictor Variables

Predictor variables include patient variables and organizational factors. The patient variables included socio-demographic and diabetes-related characteristics. The descriptive data concerning socio-demographic variables such as gender, age, ethnicity, level of education, occupation, and marital status, and diabetes-related variables such as diabetes duration, diabetes complications, and treatment have been described in the section entitled "Sample Characteristics."

Organizational factors include both structural and process variables. Structural variables include physician specialty and institution characteristics. Process variables include diabetes professional performance, the organization of healthcare systems, and patient-professional relationships. The organization of health care systems consisted of the facilitation of patient-professional relationships and organizational collaboration. Details concerning how the organizational variables were constituted are shown in Table 4.6.

Descriptive data for organizational factors

The values of organizational variables were based on data collected from the self-report questionnaires. The data concerning descriptive statistics are shown in Table 4.7.

Structural variables

Seventy-eight participants reported that the physicians they visited for diabetes treatment were endocrinologists (55.7%), 18 practiced family medicine (12.9%), and 44 were other internists (31.4%).

Table 4.6. Description of the measures of organizational variables

Concept ←	Variable	→ Measure	
Structural variables	Professional characteristics	Physician specialty	Diabetologist or not (Yes/No)
		Institution characteristics	Sum of scores of three items: 1. Number of certified diabetes educators 2. Number of disciplines 3. Level of certified diabetes care institute
Process variables	Professional performance	Preventive monitoring	Scoring the frequency of tests and examinations (DPPC-monitoring): A1C, blood glucose, lipid profile, nephropathy screening, foot examination, and eye check-up
		Preventive education	Scores of received diabetes education (DPPC-education): instructions of diet, exercise, foot care, self-monitoring of blood glucose, and tobacco cessation
	Organization of health care institutions	Facilitation of professional-patient relationships	Sum of scores of 3 items 1. Received consulting time 2. Appointment in advance 3. Checking DM passport
		Interorganizational and interdisciplinary collaborations	Number of referrals: 1. Interorganizational referral 2. Interdisciplinary referral 3. Home follow-up referral
	Professional-patient relationships	Including 3 parts: 1. With Physician 2. With Nurse 3. With dietitian	Scores of PSPS questionnaires

Table 4.7. Descriptive statistics of organizational factors

Variables	Frequency	%	Min.	Max.	M	SD	N	Skewness	Kurtosis
Physician specialty: Diabetologist	78	55.7							
Non-diabetologist	62	44.3							
Institution characteristics			1.00	9.00	7.31	2.38	140	-1.084	-.282
Professional Performance (total)			4.50	112.50	63.85	22.66	140	-.038	-.187
Preventive monitoring			.00	67.50	38.77	17.27	140	-.545	-.214
Preventive education			.00	5.00	24.72	11.97	140	-.718	-.533
Organizational collaboration			.00	5.00	1.11	1.15	140	1.001	.504
Professional- patient relationships (M)			.00	5.00	3.96	.71	140	-.957	1.235
Physician score			6.00	30.00	24.72	5.04	140	-1.097	1.023
Nurse score			9.00	25.00	20.28	4.04	69	-.766	.049
Dietitian score			11.00	25.00	19.34	4.22	63	-.339	-.926
Facilitation of p-p relationships			5.00	15.00	10.97	2.22	140	-.210	-.228

A majority of the sample usually visited the same health care institution for diabetes treatment (N=115, 82.1%). Twenty-five participants (17.9%), however, reported that they sought care at more than one institution. After checking institution characteristics with the Hualien County Health Bureau, the investigator scored the variable according to the participants' description. If a participant had visited an institution with a higher level of diabetes care, he/she was expected to receive better care no matter how many institutions he/she had visited. Therefore, for those who reported visiting more than one institution for diabetes treatment, the reported institution with the highest level of diabetes care was selected as the main institution. A majority of participants usually visited a medical center that was certified at the second highest level, with a diabetes classroom (N=88, 62.9%). Eighteen participants (12.9%) sought care at hospitals certified at the fourth highest level with a diabetes clinic, and the rest (N=34) sought care in institutions that were not certified by the TADE (Taiwanese Association of Diabetes Educators) (public health stations: N=15, 10.7%; private clinics: N=16, 11.4%; and other hospitals: N=3). By combining the numbers of diabetes team members, certified diabetes educators, and the level of diabetes care in each institution, the variables for Institution Characteristics were based on the main institution that the participant usually visited. For instance, if a participant visited a private clinic, a district hospital, a public health care clinic, and the medical center, the score of the medical center would be selected as the value of the variable of Institution Characteristics. The potential score of institution characteristics ranged from 1 to 9. The mean score of institution characteristics for the sample was 7.31 (N=140, SD=2.38).

Process Variables

The process variables included diabetes professional performance, patient-professional relationships as represented by the scores on the Patient Satisfaction with Professional Scale (PSPS), facilitation of patient-physician relationships, and organizational collaborations that included the numbers of interdisciplinary, interorganizational referrals and the connection between clinics and the community through home or phone visits. Diabetes Professional Performance refers to the preventive care that professionals provide. Data concerning the performance of diabetes professionals are presented in the section entitled "Preventive Care." Additional content of the process variables dealing with organizational factors are presented in the following section.

Patient-professional relationships

Patient-professional relationships are represented by the scores on the PSPS and include scores related to satisfaction with physicians, nurses, and dietitians. The potential total physician scores ranged from 6 to 30. Potential total nurse and dietitian scores ranged individually from 5 to 25. Half of the sample had received diabetes education from nurses (N= 69) and forty-five percent had received diet education from dietitians (N= 63). The means of total physician, nurse, and dietitian scores were 24.69 (N=140, SD=5.04), 20.28 (N=69, SD=4.04), and 19.34 (N=63, SD=4.22), respectively. The scores of participant satisfaction with professionals were higher than moderate, which indicated that participants were satisfied with services delivered by professionals. Yet, only twenty-three persons had received education from both dietitians and nurses. Therefore, the

scores of patient satisfaction with physician (PSPS-physician) were used to be the measure of the predictor variable patient-professional relationships, instead of total scores of PSPS that additionally included measures of patient satisfaction with nurses and dietitians.

Facilitation of patient-physician relationships

The variable facilitation of patient-physician relationships consisted of three components: physician consulting time, prescheduled physician appointments, and physician checking of the diabetes passport. The potential scores of the variable ranged from 3 to 16. The mean score was 10.97 (N=140, SD=2.22) (See Table 4.7).

The mean score of the item concerning the assignment of an appointment in advance was 4.26 (N=140, SD=1.26). More than eighty percent of participants (N=115) reported that they usually or always had prescheduled appointments. Eleven persons reported that their physicians never prescheduled appointments for them.

The mean score of the item regarding how often physicians checked diabetes passports during the consulting time was 2.28 (N= 140, SD=1.62). Thirty-nine persons rated that their physician usually or always asked to check their passport, but 54.3% reported that they never did so (N=76). Thus, passport utilization could be said to be uncommon for this sample.

With regard to consulting time, the majority of participants reported that the physician consulting time for each visit ranged from 3 to 10 minutes; forty percent reported only 3 to 5 minutes (N= 56) while 38 reported from 5 to 10 minutes (27.1%). Twenty persons even reported receiving consulting time of less than 3 minutes (14.3%),

16 persons reported from 10 to 15 minutes, and only 9 persons reported more than 20 minutes (6.4%).

Organizational collaborations

Organizational collaborations included referrals among institutions, from physicians to professionals in other disciplines, and for self-care follow-up in the community.

With regard to referrals among institutions, nineteen participants who usually sought diabetes treatment in hospitals responded that they were referred to primary care institutions near their home. Thirty-one participants had been referred to hospitals for special examination or advanced treatment. Eleven of sixteen participants who usually visited private clinics had never been referred to a hospital. Ninety-two of 101 participants who usually visited hospitals had never been referred to primary health care institutions in the community.

With respect to interdisciplinary referral, thirty-six participants were referred to nurses for diabetes education, thirty-three to dietitians, and only one to a social worker. Seventeen persons were referred to both nurses and dietitians for education. The majority of participants (N=87, 62.1%) reported that they had never been referred to other professionals for diabetes education.

Among the thirty-six participants who experienced home or phone visitation provided by health care professionals, nineteen of these care providers were nurses, seven were dietitians, five were physicians, and others visits were made by officers of the

Health Insurance Bureau. About 74% of participants did not receive any home or phone visit by health care professionals.

The scores of the three components were computed to obtain the value of the variable of Organizational Collaboration. Fifty-two persons were never referred in any way. The mean score was 1.11 (N=140, SD=1.15, potential scores were from 0 to 5).

Statistical Analysis for Study Variables

This section presents the statistical analysis of the study data to answer the third question: What are the relative contributions of patient characteristics and organizational factors to patient outcomes of diabetes care? Multiple regression procedures were used to examine this question. A search for violations of the assumptions underlying regression procedures was conducted and these results are presented below. The second part of the presentation gives correlations among all variables. The third part of the presentation provides results of bivariate analyses to compare the means of outcome variables related to categorical variables. The final part presents the results of regression for the three outcome variables.

Assumptions of Regressions

Prior to statistical analysis, the assumptions of regression implementation were examined for any possible violations. Skewness and kurtosis were used to examine assumptions of normality. The coefficients of skewness of A1C level data, patient adherence to self-care scores, and quality of life scores were from –1 to +1: .567, .029, and -.553, respectively (Table 4.4), and indicated that skewness was not extreme (Huck, 2000). The coefficients of kurtosis were less than 2.00 and more than –1.00 for the three

dependent variables: 082, -.820, and .518, respectively (Table 4.4), and indicated that they had a mesokurtic distribution (Huck, 2000).

Pearson Product Moment correlations were examined among the variables so as to identify possible violations of the assumption of independence. The absolute values of correlation coefficients among the independent variables ranged from .00 to .44 (see Table 4.8), which were less than .65, suggesting that the data meet the assumption of independence (Burns & Grove, 1995). Thus, multicolineality is not a concern.

Correlations of All Variables

A matrix of Pearson Product-Moment Correlations among study variables and Spearman's rho, among the variables that did not have a normal distribution, is presented in Table 4.8. All categorical variables were dichotomized so that they could be used in regression analyses.

Interestingly, among outcome variables, quality of life was found to be correlated with diabetes self-care activities ($r = .26$, $p < .001$), indicating that those individuals with diabetes who achieved higher levels of adherence to self-care regimens also perceived the quality of life to be higher. This study found no statistically significant correlation between A1C level and diabetes self-care activities and there was no statistically significant correlation between A1C and quality of life.

Among the 66 participants who visited diabetologists, however, different results were found with respect to the relationships among A1C level and other study variables. A1C level was found to have a negative correlation with quality of life ($r = -.25$, $p < .05$,

not shown in the table), indicating that participants with better glycemic control had higher scores on their perception of quality of life.

With regard to relationships among patient characteristics and outcome variables, level of adherence to self-care activities was correlated with patient age (r= .29, p<. 01), but had a negative correlation with years of education (r= -.29, p< .01). Diabetes duration was found to be slightly correlated with adherence to self-care activities (r= .21, p<. 05), as well as with preventive monitoring (r = .29, p < .05). Females were more likely to adhere to self-care regimens than men (r = -.29, p < .01, dummy coding: male=1). Aboriginal participants scored lower on levels of adherence to self-care regimen and perceptions of quality of life than did non-aborigines, with correlation coefficients -.21 (p< .05) and -.40 (p < .01), respectively. Comorbidity showed a negative correlation with quality of life (r= -.34, p< .01) but no correlation with adherence to self-care regimen. Participants who had a partner showed slightly higher perception of quality of life than those who had no partner (r = .18, dummy code: with partner = 1, without partner = 0). Participants who received insulin treatment presented slightly lower perception of quality of life than those who did not (r = -.17; dummy code: insulin prescribed=1, non-insulin prescribed = 0). No patient characteristics were correlated with level of A1C. However, of the 66 participants in the diabetologist group, those individuals who were employed with regular schedules and at regular locations had better glycemic control than those whose work did not follow a regular schedule at a fixed location (N = 31, r = -.45, p < .05, not shown in the table).

With respect to correlations among organizational factors and outcome variables, patient-professional relationships showed positive correlations with level of adherence to self-care activities and quality of life, with correlation coefficients of .34 and .36 ($p < .01$), respectively. Institution characteristics had negative correlations with level of A1C ($r = -.24$, $p < .05$) and showed a slight correlation with level of adherence to diabetes self-care activities ($r = -.19$, $p < .05$). Those participants who were seen in institutions with better-prepared diabetic professionals had better glycemic control but slightly lower patient adherence to self-care regimen. Physician specialty, on the other hand, was found to have a correlation in the opposite direction, indicating that participants who visited diabetologists presented higher A1C levels than the non-diabetologist group. Neither aspect of preventive care, however, was found to be correlated with outcomes variables for the entire sample. However, in the diabetologist group, preventive monitoring was found to have a negative correlation with A1C level ($r = -.25$, $p < .05$, not shown in the table), indicating that participants who visited diabetologists received more adequate care with respect to preventive monitoring and had better glycemic control.

Among organizational variables, level of organizational collaboration was found to be correlated with professional performance regarding preventive education care ($r = .37$, $p < .01$) but was negatively correlated with the institution characteristics score ($r = -.21$, $p < .01$). Patient-professional relationships were correlated with both dimensions of preventive monitoring and preventive education ($r = .28, .31$, respectively, $p < .01$). The preventive monitoring aspect of professional performance was associated with the level of facilitation of patient-professional relationships, which represented the level of

continuity of care. This facilitation of patient-professional relationships was correlated with patient-professional relationships ($r = .22$, $p < .05$). Participants whose physicians were diabetologists had higher scores of preventive care ($r = .34$, $p < .01$), of facilitation of patient-professional relationships, and of patient-professional relationships than those whose physicians were not diabetologists. The results indicated that physicians who were diabetologists provided better strategies to facilitate patient-professional relationships and provided more adequate preventive care than those who were not.

Among patient characteristics, males had higher levels of education than females. Age was negatively correlated with level of education. On average, aborigines were younger but had more comorbidities than non-aboriginal participants. Participants who received insulin treatments had more length of time since diagnosis than non-insulin treatment participants and were more likely to visit physicians who were diabetologists. Males were more likely to have a partner than were females. Participants who had a partner had higher levels of education and were more likely to be employed than those who had no partner.

With respect to correlations among patient characteristics and organizational factors, no patient characteristics were found to be correlated with physician specialty. Education level was positively correlated with institution characteristics scores, indicating that participants with higher levels of education were more likely to be seen in institutions with better-prepared diabetes care professionals. Aboriginal participants were less likely to be seen in institutions with better-prepared diabetes professionals but more likely to be seen at institutions with higher organizational collaborations. Participants

Table 4.8. Correlation matrix for all study variables (N=140 except N of A1C)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Adherence to self-care	-																		
2. A1C (N=100)	.01	-																	
3. Quality of life	.26**	-.10	-																
4. Institution characteristics	-.19*	-.24*	.12	-															
5. Organization collaboration	.08	.02	-.10	-.21**	-														
6. Monitoring preventive care	.08	-.12	.02	.36**	.04	-													
7. Education preventive care	.13	.19	-.01	-.02	.37**	.17*	-												
8. P-p relation[#]	.34**	.03	.36**	.09	.15	.28**	.31**	-											
9. Facilitate p-p relation[#].	.14	-.12	.11	.19*	.08	.31**	.09	.22*	-										
10. Patient age	.29**	-.17	.12	-.00	-.10	.13	-.12	.08	.08	-									
11. Patient education	-.29**	-.13	.00	.37**	-.16	.14	.14	-.04	.13	-.26**	-								
12. Diabetes duration	.21*	.13	-.10	-.03	.06	.29**	.09	.07	.11	.38**	-.14	-							
13. Comorbidity (number)	.03	.13	-.34**	-.13	.28**	.04	.15	.02	.03	.09	-.19*	.19*	-.						
14. Gender (male)	-.29**	-.18	-.01	.19*	.01	-.04	-.08	-.13	.00	.03	.49**	-.01	-.08	-					
15. Diabetologist	.11	.20*	.11	.31**	.10	.34**	.14	.21*	.44*	-.14	.13	.07	-.07	-.05	-				
16. Employed	-.13	-.04	.08	.11	-.02	-.03	-.05	-.02	.10	-.32**	.23**	-.09	-.17*	.39**	.14	-			
17. Aborigine	-.21*	.05	-.40**	-.23**	.29**	-.12	.09	-.13	-.13	-.24**	-.01	-.10	.28**	.05	-.11	.03	-		
18. Insulin prescribed	.06	.19	-.17*	.19*	.23**	.29**	.36**	.03	.16	-.08	-.03	.27**	.13	.02	.28**	.03	.08	-	
19. Marital (With partner)	-.04	-.01	.18*	.09	-.02	-.12	-.03	-.03	.10	-.04	.26**	-.06	-.03	.36**	.09	.29**	-.12	.10	-

Note. * $p < .05$; ** $p < .01$

[#] p-p relation: patient-professional relationships

receiving insulin treatment and those who were male were also more likely to be seen in institutions with higher levels of preparation of diabetes professionals.

Participants who had more comorbidities and those who were prescribed insulin treatments were more likely to be seen at institutions with higher scores on organizational collaboration. The correlation coefficients were presented in table 4.8. Similar results were obtained when comparing means of continuous variables with categorical variables by using bivariate analysis.

Bivariate Analysis of Categorical Variables

The categorical variables in this study include gender, marital status, ethnicity, occupation, pattern of diabetes treatment, and physician specialty. The ANOVA test was used to compare the means of the major continuous variables by grouping them into categorical variables. Variables that violate ANOVA assumptions of normality and equal variance were examined for comparisons by using a nonparametric test: the Mann-Whitney U test, for two groups and the Kruskal-Wallis test for multiple groups. Detailed information is presented in Tables 4.9, 4.10, and 4.11. The results were the same with that from the correlations.

Outcome variables

With regard to the A1C level, a higher level was found for participants whose physicians who were diabetologists as compared to those whose physicians were not (M = 8.54 and 7.74, respectively), $F(1,98) = 4.17$, $p < .05$. There was no difference in A1C found between participants who were employed and those who were not. Among those who were employed, however, the A1C levels of participants whose work schedule or

locations were not regular (M = 9.68) were higher than that of those for whom this was not the case (M =7.63); Mann-Whitney U = 154.00, Z = -.97, $p < .05$.

Male and female participants presented significant differences in levels of adherence to self-care activities, F (1,138) = 12.18, $p < .05$. Female participants (M = 28.15) revealed higher scores in adherence to diabetes self-care than did males (M = 23.01). Aboriginal participants were found to be less adherent to self-care regimes than were non-aboriginal participants (M = 22.40 and 27.02, respectively), F (1,138) = 6.95, $p < .05$. Participants coming from groups that spoke different languages showed significantly different scores of adherence to self-care; F (2,137) = 4.90, $p < .05$. Scheffé multiple comparison procedure revealed that the participants who usually spoke Holo (M = 28.92) presented a significantly different level of performance in adherence to self-care than did those who spoke Mandarin (M = 24.24). Because Mandarin is an official language in Taiwan, people with higher education are more likely speak Mandarin in their daily lives. The participants who usually spoke Mandarin were also found to have higher education levels than did those who spoke Minnan in the study. Likewise, male participants were found to have higher education levels than females. The results in these relationships are described later (see "patient characteristics" section).

The participants who had a partner (M = 54.05) had higher QOL scores than did those without a partner (M = 50.22); F (1,137) = 4.65, $p < .05$. Aboriginal and non-aboriginal participants differed in level of quality of life (M = 45.20 and 54.82, respectively); F (1,138) = 25.85, $p < .01$. More positive perception of quality of life was found in participants without insulin prescriptions (M=53.876) in comparison to those

Table 4.9. Bivariate analysis for outcome measure and preventive care by categorical predictor variables

	Variables	A1C	Adherence to self-care	Quality of Life	Preventive monitoring	Preventive education
Patient Characteristics	Gender	-	**	-	-	-
	Aboriginal or not	-	*	**	-	-
	Language	-	**	-	-	-
	With partner or not	-	-	*	-	-
	Employed	-	-	-	-	-
	Regular work schedule and location	#	-	-	-	-
Organizational factors	Diabetologist	-	-	-	**	-
	Certified DM care institute	-	-	*	**	-
	Insulin treatment	-	-	*	##	**

*: ANOVA test, *p < .05, **p < .01

#: Mann-Whitney U test, #p < .05, ## p < .01

-: Non-significant difference

with insulin prescriptions (M = 49.91); F (1, 137) = 4.28, $p < .05$. Finally, quality of life was also found to differ between participants who sought care in institutions certified as diabetes institutions (M = 53.89) and those seeking care in institutions without this certification (M = 50.05); F (1,138) = 4.33, $p < .05$.

No significant differences in outcome measures were found between participants who were employed and those who were not employed.

Preventive care

With respect to professional performance, one of the organizational process factors, the participants whose physicians were diabetologists and those whose physicians were not differed in the case of preventive monitoring. The group of participants being seen by diabetologists (M = 44.01) showed higher preventive monitoring scores than the non-diabetologist group (M = 32.18); F (1, 138) = 18.22, $p < .05$. Participants who were seen in the institutions certified as diabetes care institutes (M = 41.82) had higher scores in preventive monitoring than those were seen in the institutions without certification (M = 29.26); F (1, 138) = 14.97, $p < .01$. The preventive monitoring scores of the participants who were prescribed insulin injections were higher than those of the participants who were not (M = 48.05 and 36.02, respectively); Mann Whitney U = 1024.50, Z = -3.50, $p < .05$. The same results were obtained with respect to preventive education (M = 32.59 and 22.39); F (1, 138) = 20.46, $p < .01$.

Other predictor variables

Organizational factors

With respect to organizational structural variables, higher scores on the scale of diabetes institution characteristics were found among males than females, those whose physicians were diabetologists than those whose physicians were not, those who received insulin injections over those who did not, and in non-aboriginal than aboriginal groups. More collaboration was found in aboriginal vs. non-aboriginal groups, non-certified diabetes care institutions than institutions with certification, and insulin treatment than non-insulin treatment groups. More detailed information is presented in Table 4.10.

Table 4.10. Bivariate analysis for organizational factors by categorical variables

Variables	Patient-professional relationships	Institution characteristics	Organizational collaboration	Facilitation of p-p relationships
Gender	-	#	-	-
Aboriginal or not	-	#	**	-
Language	-	-	-	-
With partner or not	-	-	-	-
Employed	-	-	-	-
Regular work schedule and location	-	-	-	-
Diabetologist	-	##	-	**
Certified DM care institute	-	**	*	*
Insulin treatment	-	#	**	-

*: ANOVA test, *p < .05, **p < .01

#: Mann-Whitney U test, #p < .05, ## p < .01

-: Non-significant difference

Patient characteristics

Patient education levels were found to differ by gender (Mean: male 9.51, female 5.19), language (Mean: Mandarin 8.72, Holo 5.11, others: 5.84), marital status (Mean: with partner 7.63, without partner 5.10), employment status (Mean: employed 8.07, non-employed 6.04), and the institutions visited, with or without diabetes certifications (M = 7.64 and 4.53, respectively). Participants who were employed were younger than those who were not (mean age = 54.02 and 60.60, respectively). Participants who spoke Mandarin (mean age = 54.82, years of education = 8.72) were younger and had a higher level of education than those who spoke Holo (mean age = 60.88, year of education = 5.11). Aboriginal participants were younger (M = 53.07 and 59.02, respectively) yet had higher levels of comorbidity (M = 3.52 and 2.14, respectively) than non-aboriginal participants in the study.

Table 4.11. Bivariate analysis for patient variables by categorical variables

Variables	Age	Education	Length of time sine diagnosis	Comorbidity
Gender	-	**	-	-
Aboriginal or not	**	-	-	**
Language	^^	**	-	-
With partner or not	-	**	-	-
Employed	**	**	-	-
Regular work schedule and location	-	*	-	-
Diabetologist	-	-	-	-
Certified DM care institute	-	**	-	-
Insulin treatment	-	-	##	-

*ANOVA test, *p < .05, **p < .01

Mann-Whitney U test, #p < .05, ## p < .01

^Kruskal Wallis test ^^ p < .01

- Non-significant difference

Regression Procedures.

Regression procedures were used to further explore the ways in which combinations of organizational factors and patient characteristics contribute to patient outcomes. Step-wise multiple regression analysis was to used to determine the variables that are significant predictors of patient outcomes of diabetes care. The independent variables considered in the equation included patient characteristics (gender, age, employment, ethnicity, marital status, length of time since diagnosis, and pattern of diabetes treatment), and organizational characteristics (institution characteristics, physician specialty, preventive monitoring, preventive education, patient-physician relationships, organizational collaboration, and facilitation of patient-professional relationships). Note that the variable, duration of diabetes, was found to have a slightly platykurtic distribution (coefficient of kurtosis = -1.036). This may have affected the results of some of the regression procedures.

All regressions were conducted using standardized scores (Z scores) for study variables to minimize their wide variation of range. Three regression equations were completed to highlight the more salient, contributive factors on three outcome variables: adherence to self-care regimen, A1C, and quality of life. Regarding the outcome variable A1C level, only 71.4% (N=100) of the sample had A1C data. However, the mean scores of comorbidity and years of education were not statistically significantly different participants who had A1C data (N=100, M=2.22) and those who did not (N=40, M=2.88); $F(1, 138) = 3.359$, $p > .05$. No significant differences were found between A1C and no A1C participants in gender, aboriginal or not, employed or not, and regular

work or not. These findings suggested that the A1C and no A1C groups were homogeneous. Even though the number of participants with A1C data was only 100, which is slightly less than the minimal sample size estimated as 105 for the regression procedure; it could be argued that the results could be generalized to the entire sample. However, the limitation of inadequately updated A1C data may have affected results of the study and this issue is discussed in Chapter 5.

The contributions of the predictor variables to A1C level are discussed below.

Table 4.12. Standardized coefficients of the predictors with A1C (N=100)

Model		Standardized coefficient (Beta)	t	Sig.
1	Institution characteristics	-.22	-2.26	.026
2	Institution characteristics	-.26	-2.67	.009
	Physician subspecialty	.23	2.33	.022

Dependent variable: Z score: Most Recent A1C

Table 4.13. Model summary for regression of A1C on the predictor variables (N=100)

Model	R	R^2	Adjusted R^2	F	Sig.
1	.222	.049	.040	5.09	.026
2	.316	.100	.081	5.38	.006

Model 1: Predictors: Z score: institution characteristics

Model 2: Predictors: Z score: institution characteristics, Z score: physician specialty

Institution characteristics was first entered the equation and accounted for 4.0% of the variance in A1C level ($p < .05$, see Table 4.12 and Table 4.13). The standardized coefficient (B = -.222) indicated that lower scores in the category of institution characteristics were related to higher A1C levels. At the second step of the regression, physician specialty was entered into the equation ($p < .05$), adding an R square change of .051 to the model, which suggested that participants who searched for and found diabetologists to treat them tended to have higher A1C levels, while those who visited doctors who were not diabetologists tended to have lower A1C levels (B = .228). The sample multiple correlation coefficient of the two variables and the A1C level was .316, and the adjusted R square was .081 ($F_{(2, 97)} = 5.38$, $p = .006$) indicating that approximately 8.1 % of the variance of the A1C levels can be accounted for by the linear combination of the variables: institution characteristics and physician specialties. Patient characteristics, on the other hand, were not found to have significantly accounted for the variance of A1C level.

The relative contributions of the independent variables to adherence to self-care regimen are described below.

Table 4.14. Standardized coefficient of the predictors with Adherence to Self-Care (N=140)

Model	Standardized coefficient (Beta)	t	Sig.
1 Zscore: patient-physician relationships	.34	4.29	< .001
2 Zscore: patient-physician relationships	.33	4.34	< .001
Zscore: education	-.28	-3.60	< .001
3 Zscore: Patient-physician relationships	.31	4.08	< .001
Zscore: education	-.28	-3.68	< .001
Zscore: ethnicity	-.17	-2.22	.028
4 Zscore: Patient-physician relationships	.33	4.32	< .001
Zscore: education	-.21	-2.58	.011
Zscore: ethnicity	-.21	-2.27	.007
Zscore: Institution characteristics	-.19	-2.32	.022

Dependent variable: Z score: adherence to self-care

Table 4.15. Model summary for regression of Adherence to Self-Care on the predictor variables (N=140)

Model	R	R^2	Adjusted R^2	F	Sig.
1	.343	.118	.111	18.41	< .001
2	.441	.194	.182	16.50	< .001
3	.471	.222	.205	12.95	< .001
4	.502	.252	.230	11.37	< .001

Model 1: Predictors: Z score: patient-physician relationships

Model 2: Predictors: Z score: patient-professional relationships, Z score: education,

Model 3: Predictors: Z score: patient-professional relationships, Z score: education, Z score: ethnicity

Model 4: Predictors: Z score: patient-professional relationships, Z score: education, Z score: ethnicity, Z score: institution characteristics

The variable patient-physician relationships at first accounted for 11.1% of the variance in adherence to self-care ($p < .001$, see Table 4.14 and Table 4.15). The standardized coefficient (B = .343) indicated that participants who presented higher scores in the category of patient-physician relationships tended to achieve higher scores on adherence to self-care. At the second step of the regression, patient education was entered into the equation ($p < .05$), adding a R square change of .076 to the model, which, however, indicated a negative correlation between level of education and adherence to self-care (B = -.277). Ethnicity and health institution characteristics were entered in at the third and forth steps with additional R^2 changes of .028 and .030, respectively. Aboriginal participants tended to have lower scores on adherence to self-care than those who were members of non-aboriginal groups (B = -.169). Bivariate analysis also showed a significant difference in adherence between these two groups; $F(1, 138)=6.95$, $p< .05$. Scores for institution characteristics revealed a negative correlation with scores on adherence to self-care (B = -.192), with an additional R square change of .030. The sample multiple correlation coefficient of the four variables and scores of adherence to self-care was .50, and the adjusted R^2 was .230 ($F_{(4,135)}=11.37$, $p < .001$), indicating that approximately 23.0% of the variance of adherence to self-care can be accounted for by the linear combination of the variables: patient-professional relationships, level of education, ethnicity, and health institution characteristics.

Males and females were found to differ in adherence to self-care regimens. Patient education level and characteristics of institutions they were seen were found to differ between male and female participants. However, gender did not enter while both patient

education level and institution characteristics did enter the equation of predictor variables on patient adherence during the procedure of step-wise regression.

The relative contributions of the predictor variables to patient perception of quality of life were discussed below.

Table 4.16. Standardized coefficients of the predictors with Quality of Life (N =140)

Model		Standardized coefficients (Beta)	t	Sig.
1	Zscore: ethnicity	-.40	-5.09	< .001
2	Zscore: ethnicity	-.36	-4.80	< .001
	Zscore: patient-physician relationships	.32	4.25	< .001
3	Zscore: ethnicity	-.28	-3.75	< .001
	Zscore: patient-physician relationships	.33	4.67	< .001
	Zscore: comorbidity	-.27	-3.70	< .001

Dependent variable: Z score: quality of life

Table 4.17. Model summary for regression of Quality of Life on the predictor variables

Model	R	R^2	Adjusted R^2	F	Sig.
1	.398	.159	.153	25.85	< .001
2	.507	.257	.247	23.58	< .001
3	.571	.326	.311	21.74	< .001

Model 1: Predictors: Z score: ethnicity

Model 2: Predictors: Z score: ethnicity, Z score: patient-physician relationships

Model 3: Predictors: Z score: ethnicity, Z score: education, Z score: comorbidity

Patient ethnicity, when it was first entered into the equation, accounted for 15.3% of the variance in patient perceptions of quality of life ($p < .001$, see Table 4.16 and Table 4.17). The standardized coefficient (B = -.40) indicated that participants who were aborigines had lower scores on their perceptions of quality of life than those who were not. Bivariate analysis also showed a significant difference between these two groups; $F(1,138) = 25.85$, $p < .01$. At the second step of the regression, the variable patient-professional relationships was entered into the equation ($p < .05$), adding an R square change of .098 to the model, which indicated a positive correlation with quality of life (B = .32). Patient comorbidity was entered at the third step with additional R^2 change of .069. The higher the number of comorbidities was among participants, the lower the scores for quality of life (B = -.27). The sample multiple correlation coefficient of the three variables and scores of quality of life was .57, and the adjusted R^2 was .311 ($F_{(3,135)} = 21.74$, $p < .001$), indicating that approximately 31.1% of the variance of quality of life can be accounted for by the linear combination of the variables: patient ethnicity, patient-professional relationships, and comorbidity.

Summary

This chapter has presented description of the sample, descriptive and statistical findings related to the three research questions of the study: the patient outcomes of diabetes care, levels of diabetes preventive care received by people with diabetes in the previous year, and the relative contributions of patient and organizational factors to patient outcomes of diabetes care. Chapter V will present a discussion of theses findings.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

This chapter presents a discussion of the major findings of the study, final conclusions, and recommendations for clinical, educational, and academic settings.

Summary of the Study

The research questions of this study have focused on the following aspects of diabetes care in Hualien, Taiwan in 2002: patient outcomes of diabetes care in terms of A1C level, level of patient adherence to self-care, and quality of life; diabetes-related professional performance in terms of preventive monitoring and education for prevention of diabetes complications, and contributions of patients and organizational factors on outcomes.

Research Question 1: What Are the Patient Outcomes of Diabetes Care Received in the Previous Year?

Compared with data from the nationwide random sample Diabcare project conducted five years prior to this study, participants were younger (Age: Hualien 57.9, Diabcare: 62). Perhaps the younger age of this sample of persons with a diagnosis of diabetes is a result of the Taiwanese government's efforts to increase public awareness of diabetes and its treatment. Diabetes duration for participants in the two studies cannot be compared because 47 participants in the current study could not remember the exact year when diagnosed with diabetes. Even though individuals with severe complications stroke,

bilateral amputation, and end-stage renal disease were excluded, from the current study, the prevalence of complications such as neuropathy was higher than in the Diabcare project in 1998 (Table 5.1).

Table 5.1. Comparisons with Diabcare in 1998 (Chuang et al., 2001)

Items	% Diabcare in 1998 Nationwide random (N=2,446)	% Chang in 2003 Hualien random (N=140)
Case sources	From 25 hospitals	From one hospital[&]
Data sources	Medical records	Patient self-reported
Smoker	15.7	30.7
Treatment		
Insulin	13.7	10.0
Insulin+oral	10.2	13.6
Oral medication	74.6	70.7
Diet control	1.5	5.7
Retinopathy	31	22.1
Cataract	38	15.7
Neuropathy	30	35.0 *
Nephropathy	38[#]	24.3[##]
Hypertension	59	40.7
Foot complications	6 (ulcers)	18.6 **
Glucose self-monitoring	30 %	25%
Mean A1C level	8.1±1.6%	8.3±1.9%
<7%	26.5	30.0
7-8%	29.8	18.0
>8%	43.6	52.0

[&]Patients with severe complications were excluded

*Participants self-reported symptoms of numbness of peripheral limbs

[#] Participants presented microalbuminuria

[##]Participants reported that they were informed that they had nephropathy.

**Participants self-reported bad wound healing

Glycemic control

With an average A1C level of 8.27, it can be seen that the majority of this study's participants (70%) had a less than satisfactory level of diabetes control (A1C > 7%). These results are similar to that of Diabcare (Chuang et al., 2001) (Table 5.1). The proportion of participants who were well controlled (A1C < 7%) in this study was higher than that of the Diabcare project. The proportion of participants who need intensive treatment (A1C > 8%) in this study, however (52%), was higher than that of the sample in the Diabcare project (43.6%). In short, diabetes glycemic control in Hualien leaves a great deal of room for improvement.

Adherence to self-care regimen

The overall level of adherence to diabetes self-care can, at best, be said to be moderate among our subjects as a group. In examining specific areas of self-care, the levels of patient adherence to self-care regimens, activities medications, following a specific diet (generally low-fat with a lot of vegetables), and refraining from smoking, are high. Adherence to general diet and exercise has reached moderate levels.

In terms of a comparison of the results of this study with that of Chiou's study of patients with type II diabetes (Chiou, 2002) conducted in Taipei City, the capital of Taiwan, patient adherence to the dimension of specific diet, in terms of a low-fat diet with a lot of vegetables, was higher than in Chiou's study (Table 5.2). However, the dimensions of foot care and self-monitoring of blood glucose are in special need of improvement in the current study participants. The proportion of smoking in this study was also found to be higher than that in the Diabcare project (30.7% and 15.7%,

respectively; see Table 5.1). Some of the subjects in this study had not even so much as received smoking cessation counseling; they were not even asked by healthcare professionals about their smoking status.

Generally speaking, adherence to medication is not seen as a huge problem for the Hualien participants. However, some participants were found to be unable to accurately take medications due to their illiteracy, which became evident when they were interviewed by the investigator and the research assistant. Similar results were found in a study with a sample of 156 participants with type 2 diabetes in the United States (Garay-Sevilla et al., 1998). There were barriers to adherence to a medication regimen for individuals with diabetes who were illiterate. In addition, the majority of the sample self-reported that they took medication prescribed. However, many people did not take the medication on time everyday. The questions with respect to medication could be modified in the future research.

Although people with lower education levels in fact presented higher levels of adherence to self-care regimens in this study, their A1C levels were no better than those with higher education levels. The extent to which patient adherence to self-care is correlated with A1C level needs further investigation. In the current study, patients' reported adherence and A1C level were essentially unrelated ($r = .01$). There has been a debate with regard to whether self-report data regarding patient adherence are reliable (Toobert et al., 2000). Data of patient adherence to self-care were collected with self-reported questionnaires in the study. Social desirability may have influenced some participants' responses when data were collected by interview. To minimize potential

problems, the investigator and the assistant clarified and reconfirmed confidentiality and emphasized in the interview that it was important that participants provide true information so that study findings could result in the improvement of diabetes care in Hualien. For those who were literate and returned the self-administered questionnaires by mail, participants provided their telephone number so that if necessary, the investigator could telephone them to clarify any ambiguous responses.

Table 5.2. Comparison of patient adherence to self-care with other study

Items	Chiou study (2002) Convenience (N=259)	Chang study 2003 Random (N=140)
Sample		
Age (years)	> 40	18-70
Average (years)	73.95±11.22	57.87±10.04
Education ≤ 6 year	76.5%	61.4%
Female	56%	61%
Medication	Only oral: 100%	Only oral: 70.7% Insulin injection: 23.6%
Self-care activity scores		
General diet	56.50	52.91
Specific diet	42.58	73.36
Exercise	44.57	45.69
Self-monitoring	14.56	10.89
Foot care	56.73	32.68
Medications	88.75	86.25
Smoking	32.8%	30.7%

Quality of life

The perception of quality of life among the diabetes participants in this study revealed the highest scores in the domain of social relations and the lowest in the psychological domain. The WHOQOL-Brief questionnaire, used to measure quality of life in the study, was a general measure that is broader than some quality of life measures that focus only on medically related quality of life. This section presents comparisons of the findings of the study with the results of previous studies that used the WHOQOL to measure quality of life with samples in Taiwan.

The mean scores of physical and psychological domains in the study were lower than the means found in other samples (Table 5.1). Obviously, individuals with diabetes in Hualien perceived these two dimensions of quality of life not only lower than the subjects in the nationwide study, but also lower than the scores of both healthy and patient samples. The mean scores in the domains of social relations and environment were higher than those of other samples. Scores for each domain had wider variations than those of previous studies. The geographical environment in Hualien has often been thought to be superior to that of many other places throughout the island. In Hualien, there is less population density and environmental pollution, and throughout the region there is a common view that relationships are closer among people in Hualien than in other regions of Taiwan. Perhaps these factors contribute to the differences found between the results of this study and those of previous studies conducted with nationwide samples.

Table 5.3. Comparisons of Results in Quality of Life with Previous Studies (Yao, 2001)

	Chang study 2003	Previous study: Healthy sample	Previous study: Patient sample	Previous study: Diabetes sample
N (male/female)	140 (55/ 85)	214 (96/ 116)	840 (431/ 409)	39 (26/ 13)
Age M (male/female)	58.29/ 57.20	37.7/ 37.6	45.3/ 39.6	54.4/ 51.6
Total scores	52.95			
Physical (SD)	13.04 (2.95)	15.35 (1.81)	13.74 (2.34)	13.22 (2.22)
Psychological (SD)	12.67 (3.07)	13.70 (2.07)	13.12 (2.16)	12.74 (1.90)
Social relations (SD)	13.89 (2.57)	13.99 (2.10)	13.45 (2.32)	13.30 (2.03)
Environmental (SD)	13.32 (2.73)	13.07 (2.18)	12.63 (2.04)	12.64 (1.95)

Research Question 2: What Levels of Diabetes Preventive Care Have People with Diabetes Received in the Previous Year?

Preventive care included preventive monitoring and education to prevent individuals with diabetes from experiencing complications. Even though the A1C and lipid profiles had been included in diabetes care guidelines announced since 2001 ("Improving Diabetes", 2001), still, about 30% of participants in the study did not receive these blood tests. More than 60% of the sample reported that they did not receive an ophthalmoscopic examination over the year prior to data collection. About 35% of the participants reported they had symptoms of neuropathy. However, only 22.1% reported that their physicians checked their feet during consultations and only 40% received foot care instructions, which of especially central importance for avoiding or counteracting the problems resulting from neuropathy. Thirty percent of participants were smoking; however, twelve of 43 smokers had never been asked about their smoking status. Eighteen had never been referred to smoking cessation counseling. Clearly, therefore, there is room for improvement in professional accountability with respect to glycemic control, smoking counseling, and the prevention of the foot and eye complications that result from diabetes.

No significant contribution of preventive education was found for any variation of diabetes patient outcomes throughout the sample. However, when participants under the care of a diabetologist were compared with participants not under the care of a diabetologist, a significant correlation was found between preventive monitoring and A1C level. The results are similar to that of the project conducted by Hendricks et

al.(1999). Preventive education was found to be correlated with patient adherence to self-care regimen in non-diabetologist group. These findings might serve as a reference for physicians who are diabetologists to improve the outcomes of care by providing adequate care with respect to preventive monitoring. These findings may also be useful for providing information to physicians who are not diabetologists concerning the importance of diabetes education, despite the fact that patient adherence was not found to be correlated with glycemic control in this study.

Level of A1C was not found to be correlated with any aspect of patient adherence to self-care regimens. Glycosylated hemoglobin level reflects mean plasma glucose concentrations over two months (Gatling et al., 1997). However, because the testing time of A1C levels, collected through a review of medical records, were earlier than that of the questionnaire survey for patient adherence, the relationship between A1C level and patient adherence could not be determined. In addition, the periods of time for the examination and testing of the A1C level were quite varied in this study, with more than 50% of the participants having received the most recent examination and test before the end of August 2002, and the others having had their last test between September and December of 2002. In addition, there may have been some biases in the A1C data that was collected from different institutions. The relationships between A1C levels and other outcome variables, therefore, are clearly in need of further investigation.

Research Question 3: What Are the Relative Contributions of Patient Characteristics and Organizational Factors to Patient Outcomes?

This section discusses the contributions of patient characteristics and organizational factors to each outcome of diabetes care: A1C level, patient adherence to self-care regimen, and quality of life. Patient characteristics are thought to exercise a great influence over outcomes of diabetes care (Lo, 1998). The patient factors investigated in this study have included gender, age, education, ethnicity, length of time since diagnosis, diabetes treatment patterns, and comorbidity. Organizational factors have included structure and process aspects of quality of care. Structural factors have included the characteristics of health care institutions and physician specialty. Process factors included organizational collaboration, aspects of preventive monitoring and education of diabetes professional performance, patient-professional relationships, and the facilitation of these relationships. The variable, duration of diabetes, was found to have a platykurtic distribution that may have affected the results of some of the regression procedures.

Contributions to levels of A1C

The results of regression on A1C levels showed that no patient characteristics were correlated with A1C levels. Institution characteristics and physician subspecialty, however, were found to exert an influence on A1C levels. Participants who were seen in the health care institutions with better-prepared diabetes professionals had better glycemic control. With a moderate correlation coefficient ($r = .36$, $p < .01$), institutions with better preparation of diabetes professionals was also shown to achieve higher levels of professional performance in preventive monitoring. Preventive monitoring did not

show significant correlations with A1C levels. However, participants (N = 40) who did not receive blood tests for A1C level were found to be more likely to visit physicians who were not diabetologists and to have lower scores on the preventive monitoring aspect of professional performance than those who had their A1C levels tested. The extent to which diabetes preventive monitoring is correlated with A1C level for individuals who usually visited non-diabetologist physicians needs further investigation.

Characteristics of institution were negatively correlated with organizational collaboration with a correlation coefficient -.21($p < .01$), indicating that institutions with less preparation of diabetes professionals were more likely to make interorganizational or interdisciplinary referrals for patients. Collaboration was not shown to make any contribution to outcomes of care even though it was positively correlated with preventive education aspect of professional performance. The quality of organizational collaboration needs further investigation.

Participants who visited diabetologists had higher levels of A1C than those who visited non-diabetologist physicians ($r= .20$, $p< .05$; dummy coding: diabetologist=1). Perhaps individuals with higher A1C levels were more likely to visit or be referred to diabetologists because of the greater severity of their diabetes. However, no difference in patient comorbidity was found between diabetologist and non-diabetologist groups ($r = -.073$). Still, the results seem to suggest that the higher the A1C level, the greater the likelihood that participants who visit diabetologists will receive more adequate preventive monitoring care, and at least as low a level in comorbidity than those who visited non-diabetologist physicians.

On the other hand, from the results of bivariate analysis, data from participants who visited diabetologists showed more facilitation of patient-physician relationships than in the case of the non-diabetologist group. The results indicate that diabetologists provided better care in continuity. However, diabetologists were less likely to be active in organizational collaboration, which indicates that they made fewer referrals to community or other professionals including nurses and dietitians for patients. As diabetologists need to view diabetes care within the patient's community and to provide comprehensive care rather than only medical treatment, it might also be that the higher A1C level in the diabetologist group resulted from less organizational collaboration.

Even though the sample size of the participants who had A1C data (N=100) was small, the finding of the study about A1C levels could be generalized to the entire sample because of the homogeneity between the group who had A1C data and the group who did not. However, due to the inadequately updated A1C data used in this study, the results with respect to the relationship between A1C levels and predictor variables remain inconclusive.

Contributions to patient adherence to self-care

From the results of the regression on adherence to self-care, patient-physician relationships, patient education, patient ethnicity, and institution characteristics were found to have contributed to variations in adherence.

Participants with higher education levels were more likely to be seen in the institutions with better preparation of diabetes professionals. However, the participants who had higher education levels were less likely to adhere to diabetes self-care. These

results were similar to that of other studies (Shobhana et al., 1999). Nevertheless, it is clear that individuals with higher education levels need to pay more attention to their adherence to self-care.

Adherence to self-care was found to differ between aboriginal and non-aboriginal participants. Although aboriginal participants were younger than non-aboriginal participants in the study, they experienced higher levels of comorbidity and were less likely to adhere to diabetes self-care regimens than were non-aboriginal participants. In light of the results of data analysis of diabetes professional performance, the preventive care that aborigines received did not differ from that of non-aboriginal participants. There was also no difference found in education level between the two groups. Ethnicity, therefore, plays an important role insofar as it contributes to patient adherence to self-care regimen. Culture differences, therefore, may be the central factor in need of further investigation.

Both the level of diabetes professionalism of the institution and patient-physician relationships played important organizational roles with respect to patient adherence to a diabetes self-care regimen. Participants who were satisfied with the physician's service were more likely to adhere to diabetes self-care regimens. Similar results have been found in other studies (Freeman & Loewe, 2000; Huka et al., 1975; Lo, 1998). The results also point to a positive association between higher levels of adherence to self-care and visiting physicians by patient choice rather than by assignment (Krupat, Stein, Selby, Yeager, & Schmittdiel, 2002). Nevertheless, participants who were seen in the health care institutions with higher scores for diabetes professionalism presented lower levels of

adherence to self-care. The reason why this institutional characteristic did not appear to make a positive contribution to patient adherence needs further investigation.

Male participants were found to have higher education levels but less adherence to self-care regimens than females, and the results differed from those of other studies conducted with samples with type I (Toljamo & Hentinen, 2001) or type II diabetes (Fitzgerald et al., 1995). Male individuals need to pay special attention to their self-care management for diabetes even though they may tend to be comparatively well educated.

Contributions to quality of life

According to the results of the regression on patient perception of quality of life, it was found that patient ethnicity, patient-physician relationships, and number of comorbidities accounted for 31.1% of the variation of quality of life.

Aboriginal participants had a higher level of comorbidity and were more likely to have low perceptions of quality of life than non-aboriginal participants. Most aboriginal participants were only enrolled in the national heath insurance program, indicating that they had a relatively lower economical status than those who participated in additional private health insurance programs. They also had lower levels of adherence to self-care regimens. Quality of life was found to be positively correlated with patient adherence. Because of insufficient information about economic status, however, we do not know to what extent low adherence resulted from low economic status, subsequently influencing aboriginals' levels of comorbidity and perceptions of quality of life, which calls for further investigation.

Patient-professional relationships were found to be another predictor of quality of life. Participants who received more adequate preventive care, including monitoring and education reported more satisfactory relationships with their physicians. Similar results were found in the pilot study conducted prior to the main study (see Chapter III). However, among those participants who received preventive care, there is no correlation with quality of life. Perhaps participants who perceived higher quality of life were more optimistic, with more positive attitudes about their life and subsequently revealed a higher level of satisfaction with their relationships with physicians. Clearly, the dynamics of the contribution of patient-professional relationships to quality of life needs further investigation.

In summary, organizational structure in terms of institution characteristics and physician specialty has contribution to glycemic control. Both patient-physician relationships, one of the processes of care, and ethnicity, one of the patient characteristics, play important roles in patient adherence to self-care as well as in quality of life. Other patient characteristics, especially education and comorbidity, have also been found to contribution to patient adherence to self-care regimens. However, the precise relationships between A1C level and other variables remain highly illusive. In addition to A1C level, low reliability coefficients of the variables organizational collaboration and facilitation of patient-professional relationships were found in the study, the results with respect to the relationship the predictor variables, organizational collaboration and facilitation of patient-professional relationships, may have biases.

Conclusions

This study has focused on the outcomes of diabetes care, preventive care received by patients, and patient characteristics and organizational factors that influenced patient outcomes of diabetes care in Hualien, Taiwan in 2002. The results of the study generally support the model described in Chapter One that addressed the system of health care in Hualien County and the outcomes related to individuals with diabetes. The major findings are as follows:

Patient Outcomes of Diabetes Care

1 In light of the data of the mean A1C level of 8.27 and 70% of the sample with unsatisfactory glycemic control (A1C level > 8.0%), the quality of diabetes care in Hualien leaves a great deal of room for improvement.

2 The level of patient adherence to overall self-care regimens is moderate. Adherence to prescribed medication is good, but there is a special need for caution with respect to those who are illiterate. Adherence to dimensions of self-monitoring of blood glucose and foot care, in particular, need to be assessed and emphasized in diabetes education.

3 The perceptions of quality of life of individuals with diabetes in Hualien were shown to be more favorable in the domains of social relations and the environment, but less favorable in the physiological and psychological domains than were subjects in both the healthy and diabetes samples in other regions.

Professional Performance

The professional diabetes care provided to participants in this study in terms of preventive monitoring and education can, at best, be said to be of only moderate quality.

1. With respect to preventive monitoring: blood pressure measures, nephropathy assessment, and tests for blood glucose were obtained with barely satisfactory performance; that of lipid profiles also fell below what is to be desired. Furthermore, the performance of foot and ophthalmoscopic examinations needs to be enhanced.
2. With respect to preventive education: performance in terms of diet and exercise education seems satisfactory based on patient self-reported data. Preventive education in foot care and the self-monitoring blood glucose, however, are in definite need of enhancement. Tobacco use status is also in need of consideration when individuals with diabetes visit their physicians or receive diabetes counseling.

Contributions of Patient Characteristics and Organizational Factors

1. Patient characteristics were not found to be correlated with glycemic control, however, factors of organizational structure in terms of institution characteristics and physician specialty accounted for 8.1% of the variation of A1C level. However, these results remain inconclusive because of the wide variation of times at which the A1C levels of participants were tested.
2. Patient characteristics (ethnicity and level of education) and organizational factors in terms of structure (institution characteristics) and care process (patient-physician relationships) accounted for 23.0% of the variation in patient adherence to self-care regimens.

3. Patient demographic characteristics (ethnicity) and diabetes-related characteristics (number of comorbidities) and care process (patient-physician relationships) accounted for 31.1% of variation of perception of quality of life.

Implications and Recommendations

There are certain implications that flow from the findings of this study. However, several limitations described in Chapter I need to be taken into consideration before examining these implications. Implications for clinical practice, education, and research are as follows:

Implications for practice

The results of the data concerning patient adherence to self-care regimens and professional performance suggest that patients did not receive adequate preventive care, with respect to both monitoring the risk factors of diabetes complications and the provision of diabetes education. Preventive monitoring is in special need of improvement, particularly along the dimensions of foot examinations, eye check-ups, and lipid profiles. Inadequate testing of A1C levels is a major problem for patients who are seen only in a primary care clinic. The results suggest that enhancement of interorganizational collaboration in primary care settings is called for. On the other hand, diabetes education along the dimensions of foot care, self-monitoring, and smoking counseling has not implemented very well at all. In fact, many participants did not receive diabetes-related education at all from nurses and/or dietitians. Especially in light of the fact that diabetology clinics are quite crowded in Hualien, there is a profound need for improvement in interdisciplinary collaboration.

Individualized care needs to be taken into consideration when providing diabetes education, particularly for aborigines. Culturally sensitive diabetes care programs need to be implemented in areas with cultural diversity (Philis-Tsimikas & Walker, 2001). Individuals who are illiterate need to be provided with understandable medication instruction. Individuals with higher education levels are assumed to be more knowledgeable; in fact, however, the results show that they are in need of paying special attention to their self-care activities. The importance of periodic assessment of self-care activities to detect insufficiencies or emerging problems can hardly be overestimated.

Organizational factors include physician specialty and the level of diabetes professional preparation at a given institution. Diabetologists need to work with other professionals such as nurses and dietitians. Non-diabetologists may need to refer their clients, at times, to a diabetes specialist. Quality care will not be obtained if institutions with well-prepared professionals lack interdisciplinary collaboration or primary care settings lack inter-organizational collaboration. Obviously, the facilitation of interdisciplinary collaboration among diabetologists and other professionals, such as nurses and dietitians, represents an important element needed to improve the quality of diabetes care in Hualien. On the other hand, for those physicians who are not diabetologists, the improvement of continuity of care and patient-professional relationships may represent critical elements needed to enhance the quality of diabetes care. Health care administrators need to carefully consider how to improve the quality of interorganizational collaboration for institutions that are not well prepared, and then take action to enhance this level of preparation. They also need to facilitate interdisciplinary

collaboration through increasing allocations of health care resources and their accessibility.

The findings of the study provide a broad view of patient care consistent with a nursing approach: viewing patients not simply in terms of their disease process, but also recognizing the influence of relationships, health care environments, work environments; and other salient factors on patients' health status. The findings also suggest the importance of nursing roles in clinical practice to enhance diabetes care. Nurses could facilitate bridges between the patient and other professionals within the health care system. In developing expanded nursing roles in diabetes care, nursing administrators need to consider roles that acknowledge the context of patient care-not just the body of patient-but also the environments in which individuals and professionals interact.

The results of this study can provide the National Health Insurance Bureau with a reference for reimbursement policy decision-making in diabetes care. In addition, the public health system needs to pay special attention to the diabetes-related health problems of aboriginal people.

Implications for education

The results of this study provide suggestions for educators in both medical and nursing professional education. It is extremely important that quality of care relies not only on technical but also on interpersonal care. In addition, the importance of chronic care with complexities, as in diabetes care, must be emphasized in terms of patient self-care, the facilitation of that self-care, and collaborative care as well. Educators in medical and nursing education also need to actively recruit people with the background

knowledge, interpersonal communication skills, and experience that indicate that they would be especially adept at fostering greater levels of collaboration among healthcare professionals. Students in the health care field should also be geared to providing culturally sensitive care in order to tailor self-care regimens to individuals who may not fully be part of the dominant or mainstream culture.

Implication for research

Six implications for ongoing research have been identified. First, this study has provided a global view in terms of contributions of patient characteristics and organizational factors on outcomes of diabetes care in Hualien, Taiwan. The framework employed here may be of some use for better understanding healthcare services across disciplines and cultures. One should appeal, however, to similar studies conducted with other larger samples with other chronic diseases and in other locations, so as to add greater levels of data to the analysis and testing of the framework. Other factors that were not examined in the study, such as social support and patient diabetes-related knowledge, also need investigation in the future.

Second, because no study has been found to investigate the contributions of both patient characteristics and organizational factors on patient outcomes of diabetes care, this study has represented a search for possible predictors by using three step-wise regression procedures for each outcome variable. Sequential relationships among organizational structure and process factors, patient adherence to self-care, and glycemic control, all are in need of longitudinal research with multivariate causal models.

Third, due to the limitations of this study, the various contributions of factors to A1C level need further investigation. For prospective researchers interested in investigating the relationships between A1C and patient adherence to self-care, the self-care activities questionnaire needs to be administered two months prior to tests of the A1C level. Since self-care activities and regimens are often dynamic and subject to change, it may be better to administer the questionnaire on several occasions over time. In addition, other biomedical outcomes, such as blood glucose, metabolic syndrome and body mass index (BMI), may be considered for future research.

Fourth, although potential participants were randomly selected from the eligible patient population in Hualien, participation in the study was completely voluntary. Even though this study was possibly less subject to sample bias because findings of the study were congruent with findings of other studies, we have no way to speculate about the quality of care of those who did not agree to participate in the study. The technical problems involved in the investigation of the quality of care of this population need to be overcome so as to assure that the data result in accurate, valid, and generalizable findings.

Fifth, several issues regarding instrumentation need to be considered. The questions with respect to adherence to self-care regimen related to medication could be modified in future research. For example, we found that while the majority of our sample self reported that they took prescribed medication every day. However, some people did not take the medication on time every day. Thus, more detail regarding adherence to prescribed medication regimen should be elicited in future research. Additionally, the investigator has found no other study that uses a similar method to examine institution

characteristics, organizational collaboration, and facilitation of patient-professional relationships, which were built into this study. Unfortunately, reliabilities of the measures for organizational collaboration and facilitation of patient-professional relationships were low (α. = .30 and .54, respectively). These low reliabilities may be due to the small number of items in these scales. The measurement of the quality of organizational collaboration and facilitation of patient-professional relationships also need further refinement.

Sixth, due to the use of self-report questionnaires, it is possible that some human factors, such as social desirability, may have influenced the results of the study. Thus, some other methods to collect adherence data, such as direct observation, may be considered in future research.

Summary

In summary, the findings of this study describe the structure, process, and outcomes of diabetes care in Hualien, Taiwan over the year prior to data collection (2002). These findings suggest specific areas which may be amenable to organizational changes to improve the health and well-being of persons with diabetes in Hualien.

APPENDICES

Appendix A

Invitation Letter

On behalf of Shu-Chuan Chang, a doctoral student in the University of Texas at Austin, the United States. I am pleased to invite you to participate in her dissertation study. Shu-Chuan is an experienced nurse in diabetes care. Her study is assessing the quality of diabetes care in Hualien. If you participate in the study, the only thing you will do is to complete some questionnaires. If you are illiterate, she will ask you via interview. The results of the study will provide the professionals in Hualien information to improve the quality of diabetes care. Shu-Chuan will contact you by phone if you agree to be contacted. If you are willing to be contacted, please check the following box and return this letter to me. If you do not wish to be contacted, do not return this letter. Thank you very much.

Sincerely,
Shin-Dien Chen
Director of Diabetes Education Center
Tzu-Chi General Hospital

……..

Postcard

☐ Yes, I am willing to participate in the study.
Phone number: _____
Other (Please indicate how she can contact you.):
_____

Name: _____

Please mail to: Director of Diabetes Education Center
Tzu-Chi General Hospital
707, Sec. 3, Chung-Yang Rd.
Hualien City, Hualien County 970

Appendix B

Consent Form for Study of the Quality of Diabetes Care in Hualien

You are invited to participate in a study "Contributions of Organizational Factors and Patient Characteristics to Quality Outcomes of Diabetes Care in Hualien, Taiwan." My name is Shu-Chuan Chang and I am a doctoral student in Nursing at the University of Texas at Austin, Texas, U.S.A. This study is my dissertation research. I hope to learn about your views of your experiences of visiting diabetes clinics, quality of life, daily activity related to diabetes self-care, and some medical record data about your diabetes control. You are being asked to participate in the study because you are a diabetes patient and are or have been receiving diabetes health services at Tzu-Chi Hospital in Hualien, Taiwan. If you participate, you will be one of the approximately 125 diabetes patients in the study.

If you decide to participate, I will ask you to complete four questionnaires. These should take a total of 30 minutes. There is no risk in answering the questionnaires, except the expenditure of time required, because your name will not be linked to your personal data or questionnaire responses. If any of the questions make you uneasy, you do not have to answer those questions. This study may help you to be more aware of your self-care in diabetes management and can be an opportunity for you to contribute to better diabetes care in the future. In addition, I will ask your permission to review your medical record to learn about your diabetes control, as an indicator of the quality of diabetes care in Hualien.

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission. Your responses and medical records will not be linked to your name in any written or verbal report of this research project. Your decision to participate or to decide not to participate will not affect the health services you will receive or your relationship with your physician, health care providers, Tzu-Chi Hospital, or the University of Texas at Austin.

If you have any questions about the study or the questionnaires, please ask me. If you have any questions later, you may contact me at 03-8359095 (Hualien, Taiwan) or via E-mail scchang@mail.utexas.edu. You may also contact my supervisor, Professor Joy H. Penticuff, RN, PhD, by phone (002-1-512-471-9087) or via e-mail (joy@mail.utexas.edu). If you have any questions about your rights as a research participant, Please contact Professor Clarke Burnham, Chair of The University of Texas at Austin Institutional Review Board for the Protection of Human Research Participants, 512-323-4383.
You may keep a copy of the cover letter for your records.

You are making a decision whether or not to participate. Your signature below will indicate that you have read the information provided above and have decided to

participate in the study. If you later decide that you do not want to participate in the study, simply tell me. You may discontinue your participation in this study at any time. Thank you very much.

_____ _____
Printed Name of Participant

_____ _____
Signature of Participant Date

_____ _____
Signature of Investigator Date

I also authorize Ms. Shu-Chuan Chang to review my medical records. My medical records will be kept confidential. This medical record review is to be completed by June 30, 2003 and my authorization is withdrawn subsequent to this date.

_____ _____
Signature of Participant Date

_____
Chart number

Appendix C

Diabetes Personal Data Sheet

Code number: _____

1. Gender: __(1)Male __(2)Female

2. Age (Birth date: _____)
   __(1)18-29 __(2)30-39 __(3)40-49 __(4)50-64 __(5)65-74 __(6)>75

3. Highest level of education: ____ year
   __(1)None __(2)Elementary __(3)Junior middle __(4)High
   __(5)College/university and above

4. Occupation: __(1)None __(2)Soldier __(3)Government employee
   __(3)Schoolteacher ___(4)Labor __(5)Business __(6)Other (please indicate)_____
   4-1. Characteristics of occupation: __(1)regular schedule and location __(2)irregular location __(3)irregular schedule __(4)irregular both schedule and location

5. Marital status: __(1)Unmarried/single __(2)Married/cohabited
   __(3)Divorced/Separated __(4)Widow/Widower

6. Ethnicity (please indicate the most you feel like in your daily life):
   __(1)Mainlander __(2)Holo __(3)Hakka __(4)Amis __(5)Atayal __(6) Other (please indicate which tribe) : _____

7. Main language (The language that you usually use in daily life)
   __(1)Mandarin __(2)Holo __(3)Hakka __(4)Amis __(5)Atayal __(6)Other (please indicate which language) : _____

8. Who lives with you? (Please mark all that apply and circle the most important relationships if more than one category lives with you)
   __(1)I live alone
   __(2)I live with __(a)My spouse __(b)My offspring(s) __(c)My parent(s) __(d)My relative(s) __(f)My friend(s)

9. Health insurance: __(1) Both national health insurance and private insurance
   __(2)National health insurance only __(3)None

10. Average monthly income (estimate): _____

11. Date diagnosed with diabetes: _____(YYMM)

__(1)1-2years __(2)2-5years __(3)5-10years __(4)more than 10years

12. Known diabetes complications: __(1)Don't Know __(2)No complication
__(3)Yes, I have (Please indicate any complications you have experienced)
__a. Cataract __b. Retinopathy (eye problem due to diabetes other than cataract) __c. Kidney disease __d. Heart disease __e. Neuropathy (numbness of peripheral extremities) __f. foot problem (bad wound healing, debridement, or amputation)

13. Do you have chronic disease other than diabetes
__1. No other disease:
__2. Yes (please indicate any chronic disease
__(1)High blood pressure __(2)High cholesterol __(3)Arthritis
__(4)Tuberculosis __(5)others:_____ __(6)None

14. In the past year, have you been hospitalized for intensive diabetes treatment or diabetes complications?
__(1)No __(1) once __(2) twice __(3) three times and above
14-1. Length of stay: 1st: ____ 2nd: ____ 3rd:
14-2. Discharge diagnosis: 1st: ____ 2nd: ____ 3rd:

15. In the past year, your average pre-meal blood sugar was____
__(a)don't know.

16. Your recent pre-meal blood sugar was tested ____days ago.
16-1. How much was it? _____ __(a)Don't know.

17. Have you participated in a diabetes education program (multiple choices)
__(1)Never
__(2)Yes (please indicate all that apply as follows)
__(a)Lecture diabetes education
__(b)Group education with discussion
__(c)Individual education
17-1. Has your family participated diabetes education?
__(1)Yes __(2)No
17-2. How many hours did you have diabetes education over the past year?
__(1)Less than 2 hours __(2)3-4 hours __(3)4-6 hours __(4) 6-8hours
__(5)More than 8 hours

18. Your current treatment for diabetes is
__(1)Oral medication only __(2)Insulin injection only
__(3)Combined oral and insulin injection

19. Do you have a diabetes patient passport?__ (1)Yes __(2) Has been lost __(3)No

Appendix D

Part I. Patient Perception of Diabetes Care Quality (PPDCQ)

A. Access to Care and Continuity of Care

The following questions ask you about your experience of clinic visits for diabetes care over the past year. Please indicate the choice that you feel is the most accurate by putting a mark in the corresponding box.

1. Besides being referred for treatment by a physician, I usually visit the same healthcare institution for diabetes treatment at (Please indicate the name of the institution in the underlined blank)
   __(1)A private clinic: ____ (please continue to answer questions 1-1 and 1-2)
   __(2)A public health clinic: ___(please continue to answer questions 1-1 and 1-2)
   __(3)Christian Hospital (please continue to answer questions 1-1 and 1-3)
   __(4)Tzu-Chi Hospital (please continue to answer questions 1-1 and 1-3)
   __(5)Other hospital within Hualien County: _____ (please continue to answer questions 1-1 and 1-3)
   __(6)Other hospital outside of Hualien County: ____ (please continue to answer questions 1-1 and 1-3)

   1-1. I visit this clinic because of (please choose the most important reason)
   __(1)Convenience and accessibility
   __(2)The medical reputation of the physician
   __(3)The physician's attitudes
   __(4)The reputation of the hospital
   __(5)Other (please indicate)

   1-2. In the past year, has a physician referred you to another physician or hospital for any special examination or treatment related to diabetes? (Multiple choice)
   __(1) Yes, I was referred for a special examination, which examination:
   __(2) Yes, I was referred for advanced diabetes treatment __(3) Never

   1-3. Has a physician suggested that you visit the clinic in the community where I live?
   __(1) Yes __(2) No

2. The specialty of the physician who prescribes diabetes medication for me is
   __Diabetes specialty __Family medicine __Other internal medicine __Surgeon
   __Other (Please indicate):_____ __Don't know

3. In addition to being referred by a physician, I visit the same physician for diabetes treatment every time:
   __(1)Never __(2)very seldom __(3)sometimes __(4)often __(5)All the time

4. Has the physician recommended me to visit the clinic for eye-checkup?
__(1) Yes (Please answer question 7-1 and 7-2)
__(2) No (please skip to answer question 8)

4-1. Over the past one year, I visited the clinic for an eye-checkup according to the physician's recommendation:
__(1)Yes (Please answer question 7-2)
__(2)No (please skip to answer question 8)

4-2. Did you administer eye drops that made your vision blurred before eye-checkup?
__(1)Yes __(2)No

5. Over the past year, there have medical professionals concerned or instructed me about diabetes through phone call or home visit.
__(1) Never
__(2)Yes, once __(3)Yes, twice __(4)Yes, three times __(5)Yes, more than 3 times

5-1. Who were they?
__(1)nurse __(2)dietician __(3)physician __(4)social worker __(5)other(please indicate):_____ __(6)Don't know

6. Every time that I have visited a diabetes clinic, I have been given an appointment for the next visit:
__(1)always __(2)often __(3)sometimes __(4)rarely __(5)never

7. On average, how much time does it take for you to visit a diabetes clinic (including transportation, waiting, and the consultation with the physician)?
__(1)less then 30 minutes __(2)30 minutes to 1 hour __(3)1-2 hours __(4)2-3 hours __(5)3-4hours __(6)more than four hours.

7-1. On average, how long does it take for you to get to the doctor's office or clinic (both the time getting there and the time that it takes you to get home, in other words, round trip)?
__(1)less than 30 minutes __(2)30 minutes to 1 hour __(3)1-2 hours __(4)2-3 hours __(5)more than 3 hours.

7-2. On average, how long do you have to wait to see the doctor when you visit his or her clinic?
__(1)less than 15 minutes __(2)15-30 minutes __(3)30-45 minutes __(4)45 minutes to 1 hour __(5)1-2 hours __(6)more than 2 hours.

7-3. On average, how long does the physician spend with you when you visit a diabetes clinic?

__(1)less than 3 minutes __(2)3-5 minutes __(3)5-10 minutes
__(4)10-15 minutes __(5)15-20minutes __(6)more than 20 minutes

8. How would you rate the convenience of your visit to a diabetes clinic
__(1)very convenient __(2)somewhat convenient __(3)acceptable
__(4)inconvenient __(5)very inconvenient

9. In general, how long your physician prescribes the diabetes medication per time for you?
__(1)less than 7 days __(1)2 weeks __(3) 1 month __(4)2 months __(5)3 months
__(6) Not regular

10. I visit a diabetes clinic regularly, according to the physician's recommendation:
__(1)always __(2)often __(3)sometimes __(4)rarely __(5)never

11. I take blood tests other than blood sugar regularly according to the physician's recommendation.
__(1)always __(2)often __(3)sometimes __(4)rarely __(5)never
__(6)I don't remember any physician's recommendation about blood tests.

12. I bring my Diabetes Passport with me when I visit a clinic for diabetes treatment.
__(1)always __(2)often __(3)sometimes __(4)rarely __(5)never

13. The diabetes physician checks my Diabetes Passport when I visit him.
__(1)always __(2)often __(3)sometimes __(4)rarely __(5)never

14. On average, how often did you visit the clinic in person for diabetes in the past year?
__(1)once per year __(3)once every six months __(4)once every 3-4 months __(5)once every 2 months __(6)once per month __(7)once every 2-3 weeks __(8)once per week or more often

B. Patient Satisfaction with Professionals Scale

The following questions ask you about your perception of professionals when you meet with them for diabetes care over the past one year. Please indicate the choice that you feel is the most accurate by putting a mark in the corresponding box.

15. The physician considers my individual condition for my diabetes treatment when I visit the diabetes clinic.
__(1)always __(2)often __(3)sometimes __(4)rarely __(5)never

16. The physician explain the progress of diabetes, such as results of examination and treatment
__(1)always __(2)often __(3)sometimes __(4)rarely __(5)never

17. The physician's explanation about my diabetes is clear to me.
__(1)always __(2)often __(3)sometimes __(4)rarely __(5)never

18. I feel that the physician is concerned for me when I visit the diabetes clinic.
__(1)always __(2)often __(3)sometimes __(4)rarely __(5)never

19. I feel respected by the physician who treats me.
__(1)always __(2)often __(3)sometimes __(4)rarely __(5)never

20. Has a nurse instructed me about diabetes self-care?
__(1)Yes
__(2)No (please skip to answer question11)

21. The nurse takes my individual condition or situation into account when he or she instructs me about how to control my diet.
__(1)always __(2)often __(3)sometimes __(4)rarely __(5)never
__(6)I don't remember that any nurse has ever instructed me concerning my diet.

22. The nurse's explanation about diabetes self-care is clear to me.
__(1)always __(2)often __(3)sometimes __(4)rarely __(5)never

23. I feel that the nurse who gives me instruction concerning diabetes self-care is genuinely concerned for me.
__(1)always __(2)often __(3)sometimes __(4)rarely __(5)never

24. I feel that the nurse who gives me instruction concerning diabetes self-care respects me
__(1)always __(2)often __(3)sometimes __(4)rarely __(5)never
25. Has a dietitian instructed me about diet control?
__(1)Yes
__(2)No (Please skip to answer question 16)

26. The dietitian takes my individual condition or situation into account when he or she instructs me as to how to control my diet.
__(1)always __(2)often __(3)sometimes __(4)rarely __(5)never
__(6)I don't remember that any dietitian has ever instructed me concerning my diet.

27. The dietitian's explanation about diet control is clear to me.
__(1)always __(2)often __(3)sometimes __(4)rarely __(5)never

28. I feel that the dietitian is concerned for me when he or she gives me instruction about my diet needed to control my diabetes.
__(1)always __(2)often __(3)sometimes __(4)rarely __(5)never

29. I feel like the dietitian respects me when he or she instructs me about my diet to control my diabetes.
__(1)always __(2)often __(3)sometimes __(4)rarely __(5)never

30. I am satisfied with the services provided by the physician in the diabetes clinic:
__(1)not at all __(2)somewhat __(3)sometimes __(4)very __(5)extremely

31. I am satisfied with the services provided by nurses in diabetes education:
__(1)not at all __(2)somewhat __(3)sometimes __(4)very __(5)extremely
__(6) I never have any contact with the nurse for diabetes education

32. I am satisfied with the services provided by dietitians in diabetes diet:
__(1)not at all __(2)somewhat __(3)sometimes __(4)very __(5)extremely
__(6)I never have any contact with the dietitian for diabetes education

33. I am satisfied with the registration process of the clinic:
__(1)not at all __(2)somewhat __(3)sometimes __(4)very __(5)extremely

34. In general, I am satisfied with the services of the diabetes clinic:
__(1)not at all __(2)somewhat __(3)sometimes __(4)very __(5)extremely

35. I have been given individual diabetes education about___ from health care providers in the clinic (multiple choice, please mark all choices that apply).

☐ 35-1. Diabetes medication
From ☐(1)physician ☐(2)nurses ☐(3)dietitian ☐(4)other (Please indicate)

☐ 35-2. Diet
From ☐(1)physician ☐(2)nurses ☐(3)dietitian ☐(4)other (Please indicate)

☐ 35-3. Exercise
From ☐(1)physician ☐(2)nurses ☐(3)dietitian ☐(4)other (Please indicate)

☐ 35-4. Foot care
From ☐(1)physician ☐(2)nurses ☐(3)dietitian ☐(4)other (Please indicate)

☐ 35-5. Hypoglycemia
From ☐(1)physician ☐(2)nurses ☐(3)dietitian ☐(4)other (Please indicate)

☐ 35-6. Hyperglycemia
From ☐(1)physician ☐(2)nurses ☐(3)dietitian ☐(4)other (Please indicate)

☐ 35-7. Diabetes chronic complications
From ☐(1)physician ☐(2)nurses ☐(3)dietitian ☐(4)other (Please indicate)

☐ 35-8. Self-monitoring of blood glucose
From ☐(1)physician ☐(2)nurses ☐(3)dietitian ☐(4)other (Please indicate)

☐ 35-9. Smoking
From ☐(1)physician ☐(2)nurses ☐(3)dietitian ☐(4)other (Please indicate)

☐35-10. Stress coping
From ☐(1)physician ☐(2)nurses ☐(3)dietitian ☐(4)other (Please indicate)

☐35-11. I don't remember that any health professional has given me any above information.

36. In the past year, has a physician referred you to another type of medical professionals for diabetes education or other assistance? (Multiple choices)
__(1)Nurse __(2)Dietitian __(3)social worker __(4)Never

37. Over the past year, did any medical care professional take off your shoes and socks to check your feet?
__(1)Yes __(2)No

Appendix D

Part II. The Summary of Diabetes Self-Care Activities Questionnaire (SDSCA)

The questions below ask you about your diabetes self-care activities during the past 7 days. If you were sick during the past 7 days, please think back to the last seven days that you were not sick. Please circle the applicable number of days, and answer other questions if applicable.

1. On how many the last SEVEN DAYS have you followed a balanced food eating plan?
   0 1 2 3 4 5 6 7

2. On average, over the past month, how many DAYS PER WEEK have you followed your eating plan?
   0 1 2 3 4 5 6 7

3. On how many of the last SEVEN DAYS did you eat high fat foods such as red meat or full-fat diary products?
   0 1 2 3 4 5 6 7

4. On how many of the last SEVEN DAYS did you eat at least 5 dishes of fruit and vegetable?
   0 1 2 3 4 5 6 7

   __4-1. I ate a lot of vegetable, but I dislike fruit.
   ↳ __4-1-1. I don't eat lots of fruit because I am afraid too much sweets.
   __4-2. I ate a lot of fruit, but dislike vegetable.

5. On how many of the last SEVEN DAYS did you participate in at least 30 minutes of physical activities? (Total minutes of continuous activity, including walking)
   0 1 2 3 4 5 6 7

   __Yes, I did, but less than 30 minutes.

6. On how many of the last SEVEN DAYS did you participate in a specific exercise session (such as swimming, walking, biking) other than what you do around the house or as part of your work?
   0 1 2 3 4 5 6 7

7. On how many of the last SEVEN DAYS did you (or your family/friend/or neighborhood health care personnel) test your blood sugar?
   0 1 2 3 4 5 6 7

8. On how many of the last SEVEN DAYS did you (or your family/friend/or neighborhood health care personnel) test your blood sugar the number of times recommended by your health care provider?
   0 1 2 3 4 5 6 7

9. On how many of the last SEVEN DAYS did you check your feet?
   0 1 2 3 4 5 6 7

10. On how many of the last SEVEN DAYS did you inspect the inside of your shoes?
    0 1 2 3 4 5 6 7

11. On how many of the last SEVEN DAYS did you smoke a cigarette—even one puff—during the past SEVEN DAYS?
    0 1 2 3 4 5 6 7

Self-Care Recommendation

1R. Which of the following has your health care team (doctor, nurse, dietitian, or family/friend) advised you to do? Please check all the apply:
__a. Follow a balanced food eating plan
__b. Follow a eating plan tell you how to distribute the amount of your each meal
__c. Follow a low-fat eating plan
__d. Reduce the number of calories you eat to loose weight
__e. Eat lots (at least 5 servings per day) of fruits and vegetables
__f. Eat very few sweets (for example: desserts, non-diet sodas, candy bars)
__g. Other (specify):
__h. I have not been given any advise about my diet by my health care team.

2R. Which of the following has your health care team (doctor, nurse, dietitian, or family/friend) advised you to do? Please check all the apply:
__a. Just exercise frequently
__b. Exercise continuously for a least 20 minutes at least 3 times a week.
__c. Fit exercise into your daily routine (for example, park a block away and walk)
__d. Engage in a specific amount, type, duration and level of exercise.
__e. Other (specify):
__f. I have not been given any advise about exercise by my health care team.

3R. Which of the following has your health care team (doctor, nurse, dietitian) advised you to do? Please check all the apply:
__a. Test your blood sugar using a machine to read the results.
__b. Go for neighborhood health care services to test your blood sugar.
__d. Other (specify):
__e. I have not been given any advice either about testing my blood or urine sugar level by my health care team.

4R. Which of the following medications for your diabetes has your doctor prescribed? Please check all that apply:

__a. Only insulin injection

__a1)An insulin shot 1 or 2 times a day

__a2)An insulin shot 3 or more times a day.

__b. Only diabetes pills to control my blood sugar level.

__b1)oral medication 1 or 2 times a day

__b2)oral medication 3 or more times a day.

__c. Both insulin injection and diabetes pills

__d. Other (specify):

__e. I have not been prescribed either insulin or pills for my diabetes.

5R. Which of the following has your health care team (doctor, nurse, dietitian, or family/friend) advised you to do? Please check all the apply:

__a. Check your feet every day.

__c. Dry the sutures between the toes after washing your feet.

__d. Warning about wearing shoes for diabetes patients.

__e. I have not been given any advice either about testing my blood or urine sugar level by my health care team.

6R. Have you been asked about smoking status when you visit clinic?

__Yes __Never

7R. If you are smoker, have you been talked about how to withdraw smoking? Or have you been referred to participate a class for withdrawal?

__Yes __Never __I don't smoke

Medication

5A. On how many of the last SEVEN DAYS did you take your recommended oral diabetes medication?

0 1 2 3 4 5 6 7

6A. On how many of the last SEVEN DAYS did you take your oral diabetes medication on time recommended?

0 1 2 3 4 5 6 7

7A. On how many of the last SEVEN DAYS did you take your recommended insulin injection?

0 1 2 3 4 5 6 7

8A. On how many of the last SEVEN DAYS did you take insulin injection on time recommended?

0 1 2 3 4 5 6 7

Foot Care

9A. On how many of the last SEVEN DAYS did you wash your feet?

0 1 2 3 4 5 6 7

10A. On how many of the last SEVEN DAYS did you dry the sutures between the toes after washing your feet?

0 1 2 3 4 5 6 7

Smoking

If you smoke, please answer question 11A and 12A

11A. When did you smoke last time?

__More than two years ago (or have not smoked) __1-2 years __4-12 months ago
__1-3 months ago __within last month __within last week __Today

12A. How many cigarettes did you smoke on an average day? _____

Appendix D

Part III. Quality of Life WHO-BREF Taiwan Version (WHOQOL)(Backtranslation)

1. In general, how would you evaluate your quality of life?
__(1)not satisfactory at all __(2)somewhat satisfactory __(3)moderately satisfactory __(4)very satisfactory __(5)extremely satisfactory

2. In general, are you satisfied with your health?
__(1)not satisfied at all __(2)somewhat satisfied __(3)moderately satisfied __(4)very satisfied __(5)extremely satisfied

3. To what extent do you feel that your pain hinders you in doing what you need to do?
__(1)never hinders __(2)slight hindrance __(3)moderate hindrance __(2)great hindrance __(5)total hindrance

4. Do you need medical treatment to cope with your daily life?
__(1)no need at all __(2)slight need __(3)moderate need __(4)great need __(5)extreme need

5. Do you enjoy your life?
__(1)do not enjoy at all __(2)enjoy a little __(3)enjoy moderately __(4)enjoy greatly __(5)totally enjoy

6. Do you feel your life has meaning?
__(1)none at all __(2)slight __(3)moderate __(4)great __(5)total

7. How good is your ability to concentrate?
__(1)not good at all __(2)poor __ (3)moderately good __(4)very good __(5)extremely good

8. How safe do you feel in your daily life?
__(1)not safe at all __(2)a little safe __(3)moderately safe __(4)very safe __(5)extremely safe

9. Do you live in a healthy environment (for example: pollution, climate, noise, transportation)?
__(1)not healthy at all __(2)slightly healthy __(3)moderately healthy __(4)very healthy __(5)extremely healthy

10. Do you have enough energy for your daily life?
__(1)no energy at al __(2)a little energy __(3)moderate energy

__(4)great energy __(5)full of energy

11. Can you accept your appearance?
__(1)no acceptance __(2)a little acceptance __(3)moderate acceptance
__(4)great acceptance __(5)total acceptance

12. Do you have enough money for whatever you need?
__(1)not enough at all __(2)almost enough __(3)just enough
__(4)quite enough __(5)more than enough

13. Is it convenient for you to get the daily information you need?
__(1)not convenient at all __(2)somewhat convenient __(3)moderately convenient
__(4)very convenient __(5)extremely convenient

14. Do you have the opportunity to take leisure time?
__(1)no opportunity at all __(2)some opportunity __(3)moderate amount of opportunity __(4)many opportunities __(5)every opportunity

15. How is your ability to get around?
__(1)not good at all __(2)poor __(3)moderately good __(4)very good
__(5)excellent

16. How satisfied are you with the sleep you get?
__(1)not satisfied at all __(2)somewhat satisfied __(3)moderately satisfied
__(4)very satisfied __(5)extremely satisfied

17. Are you satisfied with your ability to perform routine daily activities?
__(1)not satisfied at all __(2)somewhat satisfied __(3)moderately satisfied
__(4)very satisfied __(5)extremely satisfied

18. Are you satisfied with your working ability?
__(1)not satisfied at all __(2)somewhat satisfied __(3)moderately satisfied
__(4)very satisfied __(5)extremely satisfied

19. Are you satisfied with yourself?
__(1)not satisfied at all __(2)somewhat satisfied __(3)moderately satisfied
__(4)very satisfied __(5)extremely satisfied

20. Are you satisfied with your personal relationships?
__(1)not satisfied at all __(2)somewhat satisfied __(3)moderately satisfied
__(4)very satisfied __(5)extremely satisfied

21. Are you satisfied with your sexual life?

__(1)not satisfied at all __(2)somewhat satisfied __(3)moderately satisfied
__(4)very satisfied __(5)extremely satisfied

22. Are you satisfied with the support you get from your friends?
__(1)not satisfied at all __(2)somewhat satisfied __(3)moderately satisfied
__(4)very satisfied __(5)extremely satisfied

23. Are you satisfied with your living conditions?
__(1)not satisfied at all __(2)somewhat satisfied __(3)moderately satisfied
__(4)very satisfied __(5)extremely satisfied

24. Are you satisfied with how convenient it is for you to get medical services?
__(1)not satisfied at all __(2)somewhat satisfied __(3)moderately satisfied
__(4)very satisfied __(5)extremely satisfied

25. Are you satisfied with the transportation you use?
__(1)not satisfied at all __(2)somewhat satisfied __(3)moderately satisfied
__(4)very satisfied __(5)extremely satisfied

26. Do you often have negative feelings (for example: depression, despondency, anxiety, anguish)?
__(1)Never __(2)sometimes __(3)rather frequently __(4)very frequently
__(5)always

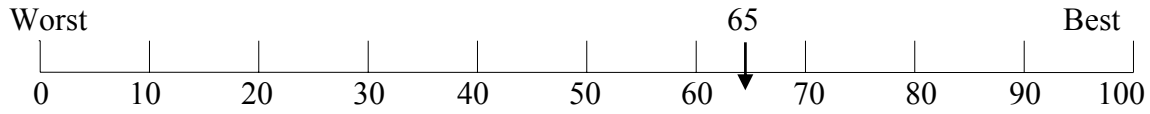
27. Do you feel respected by others?
__(1)none at all __(2)slight __(3)moderate __(4)great __(5)total

28. Are you usually able to get the things you like to eat?
__(1)never __(2)sometimes __(3)rather frequently __(4)very frequently
__(5)always

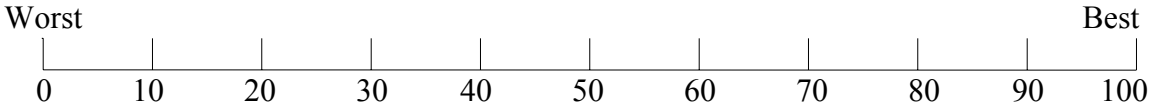
The following questions are asking you about your satisfaction with quality of life in the recent 2 weeks. Please draw an arrow to indicate your rating and write down the number of rating. “100” indicates the “best”; whereas, “0” indicates the “worst”.

For example:

How would you rate your health-related quality of life?



1. In general, how would you rate your health-related quality of life?



2. In general, how would you rate your quality of life before being diagnosed with diabetes?

Appendix E

Medical Record Checklist

Code number: _____

Measure	Medical Records Data Over past 12 months (Date and data)	Frequency or Response
1. A1C		
2. Blood glucose (AC)		
3. Blood glucose (PC)		
4. Nephropathy assessment …Serum creatinine		
…Urine analysis		
…Microalbumin		
5. Lipid profile …Total Cholesterol		
…LDL-C		
…HDL-C		
…Triglyceride		
6. Blood pressure		
7. Ophthamalscopic Exam.		
8. BW (the first and last)		
9. Consulting DM team		

Appendix F

Cover Letter for Questionnaire (Pilot)

Quality of Diabetes Care in Hualien, Taiwan

You are invited to participate in a study of "Quality of Diabetes Care in Hualien Taiwan." My name is Shu-Chuan Chang and I am a doctoral student in Nursing at the University of Texas at Austin, Texas, U.S.A. This project is the pilot study of my dissertation research. I hope to learn the experience of diabetes care you received. You are being asked to participate in the study because you are a diabetes patient and are receiving the health services at Tzu-Chi Hospital in Hualien, Taiwan. If you participate, you will be one of the approximately 150 people in the pilot study.

If you decide to participate, I will ask you to complete a questionnaire. The completion of the questionnaire will take about 15 minutes. There is no risk in answering these questionnaires. Great care will be used to maintain confidentiality. This study will be a good opportunity for you to contribute your information about diabetes to the health care system as the reference for providing better diabetes care in the future.

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission. Your responses will not be linked to your name in any written or verbal report of this research project. Your decision to participate or to decide not to participate will not affect the health services you will receive and your relationship with your physician, health care providers, Tzu-Chi Hospital, or the University of Texas at Austin.

If you have any questions about the study, please ask me. If you have any questions later, you may contact me at 03-8359095 (Hualien, Taiwan) or via E-mail scchang@mail.utexas.edu. You may also contact my supervisor Professor Joy H. Penticuff (Ph.D) by phone (002-1-512-471-9087) or via e-mail (joy@mail.utexas.edu).

You may keep a copy of the cover letter for your record.

You are making a decision whether or not to participate. Your actions of answering the questionnaires will indicate that you have read the information provided above and have decided to participate in the study. If you later decide that you do not want to participate in the study, simply tell me. You may discontinue your participation in this study at any time. Thank you very much.

Sincerely,
Shu-Chuan Chang
Doctoral Candidate
UT. Austin School of Nursing

Appendix G

Invitation Letter—Chinese Version

邀請函

_____先生/女士，您好：

這封信是邀請您參加章淑娟小姐 (美國奧斯汀德州大學護理博士班學生)的博士論文研究計劃，章小姐是一位在糖尿病照護很有經驗的護理人員，她的論文研究是要評估花蓮縣的糖尿病照護品質並探討影響品質的因素，希望您能提供寶貴的經驗，如果您參與這個計畫，唯一需要您幫忙的是花三十分鐘填寫問卷，如果您不方便閱讀問卷，她本人或她的助理會透過面對面或電話訪問來協助您完成，研究的結果將提供花蓮縣醫護人員未來改善糖尿病照護品質的參考，如果您同意，章小姐將會打電話和您聯絡，如果您**同意參加**，則請勾選下列回函並立即寄回慈濟醫院糖尿病中心，如果您同意，就不需要寄回此回函，感恩您。敬祝身心健康愉快！

慈濟醫院 糖尿病保健推廣中心 敬上

回函請寄

970 花蓮市中央路 3 段 707 號
慈濟醫院
糖尿病人保健推廣中心 收

…….

回函

□ 我同意參加，請和我聯絡

姓名：_____

電話：_____

或其他聯絡方式：_____

Appendix H

Cover Letter for Questionnaire (Pilot)

封面說明

您好，很榮幸能邀請您參與這個測試問卷的研究計劃，我的博士論文主題是「花蓮縣糖尿病照護品質」，這個計劃是我的博士論文問卷量表的測試研究，我的名字叫做章淑娟，現就讀美國奧斯汀德州大學護理學院博士班，這個計劃是爲我的博士論文做準備，我希望了解您對糖尿病照護服務之看法以及您個人的糖尿病經驗。您會被邀請參與這個研究計劃是因爲您在花蓮縣的醫療院所就醫，如果您參加了，將會是 150 位糖尿病人中的一位。

如果您決定參與，我會請您花大約十五分鐘填寫問卷，填寫問卷沒有任何的危險性，只是需要花您一點時間，您的名字將不會和您所填答的內容相連結，這個研究會幫助您比較了解您在糖尿病的自我照顧，也是一個您能對較高品質的糖尿病照護有所貢獻的機會。問卷中如果有任何讓您覺得不方便回答的問題，您可以不必回答每一個問題。

任何您所提供會被認出您個人的訊息都將保留隱私權，除非徵得您的同意，否則不會被透漏，您所填答的內容在發表口頭或書面研究結果的時候也將不會列出您的姓名，您決定參加與否不會影響任何醫療照護機構對您的服務，也不會影響您和醫護人員、花蓮的醫療院所、或美國德州大學的關係。

如果您有任何有關這個研究的問題，可以隨時問我，我的聯絡電話是 0921-863275 或 03-8561825 轉 2401 或 2403，或用電子郵件和我聯繫，我的信箱是 scchang@mail.utexas.edu；您也可以用英文直接和我的指導教授 Penticuff 博士聯繫，她在美國的電話是 512-471-9087，她的電子郵件信箱是 joy@mail.utexas.edu。

您可以保留這張說明做爲參考。

您現在正在決定是否參加此研究，填答這份問卷表示您已充分了解並同意參與這個研究，如果您決定不想繼續參加，請讓我知道，您可以隨時中斷參與，再次感謝。

美國奧斯汀德州大學 護理學院
博士候選人 章淑娟 敬上

Appendix I

Consent Form for the Study---Chinese Version

同意書

您好，我很榮幸能邀請您參與這個探討花蓮縣糖尿病照護品質的研究計劃，我的名字叫做章淑娟，現就讀美國奧斯汀德州大學護理學院博士班，這是我的博士論文計劃，我希望了解過去一年您就醫診治糖尿病的經驗、您的糖尿病自我照顧活動，和您對健康相關生活品質的看法。希望藉由您寶貴的經驗，可以了解影響花蓮縣糖尿病照護品質的因素，以作爲未來相關單位改進的參考。您會被邀請參與這個研究計劃是因爲您曾經在花蓮慈濟醫院就醫，如果您參加這個研究，將會是 125 位中的一位。

如果您決定參加，我會請您花大約三十分鐘回答一份問卷，填答問卷沒有任何的危險性，只是需要花您一點時間，您的名字將不會和您所回答的內容相連結，這個研究會幫助您了解您在糖尿病的自我照顧，也是一個您能對花蓮糖尿病照護品質的提昇有所貢獻的機會，您的經驗非常寶貴，我很誠摯的邀請您參予我的研究。此外，我也想徵得您的同意查閱您的病歷以了解您的糖尿病控制狀況。

任何您個人的資料都將保留隱私權，除非徵得您的同意，否則不會被洩漏，您所填答的內容在發表研究結果時是以集體的方式呈現，不會列出個人的姓名，您決定參加與否不會影響慈濟醫院或其他的醫療院所對您的服務，也不會影響您和任何醫護人員、慈濟醫院、或美國德州大學的關係。

如果您有任何有關這個研究的問題，可以隨時問我，我花蓮的聯絡電話是 0921-863275，或用電子郵件和我聯繫，我的信箱是 scchang@mail.utexas.edu；您也可以用英文直接和我的指導教授 Penticuff 博士聯繫，她在美國的電話是 512-471-9087，她的電子郵件信箱是 joy@mail.utexas.edu。

您可以保留一份影本以做爲參考。

您現在正在決定是否參加這個研究，若您已經了解它的重要性並且同意參加，請在後面簽名，如果您稍晚決定不想繼續參加，只要和我說一聲，您可以隨時中斷參與，再次感謝您的合作。

美國奧斯汀德州大學 護理學院 博士候選人
章淑娟 敬上

_____ _____(關係:____)
*參加者姓名(請以正楷書寫) 關係人(請以正楷書寫) (若參加者不識字)

_____ _____
*參加者(或關係人)簽名 日期

_____ _____
研究者簽名 日期

本人同意章淑娟小姐因研究需要查閱我的病歷，本同意書有效時間至民國 92 年 6 月 30 日止。

_____ _____
立同意書人簽名 日期

病歷號碼 (健康保險證號碼)：_____

Appendix J

Chinese Version of All Questionnaires

第一部份 門診糖尿病照護品質度調查問卷

A. 醫療照護可近性和持續性

這個部分是問您有關**最近一年內**到門診看糖尿病的經驗，請依您的實際的經驗和感受來回答每一個問題，請選擇最適合的一個答案，註明複選的題目請勾選任何適合的答案。

1. 除了特別轉診，您通常都在哪裡看糖尿病？
   - □ (1)私人診所 (請續答 1-1 和 1-2)
   - □ (2)衛生所 (請續答 1-1 和 1-2)
   - □ (3)門諾醫院或署立花蓮醫院 (以前的省立醫院) (請續答 1-1 和 1-3)
   - □ (4)慈濟醫院 (請續答 1-1 和 1-3)
   - □ (5)其他花蓮縣內的醫院：_____ (請續答 1-1 和 1-3)
   - □ (6)花蓮縣以外的醫院：_____ (請續答 1-1 和 1-3)

   1-1. 您在此看門診**主要因素**是 **(請選一項最重要的原因)**
   - □(1)就醫方便
   - □(2)醫師醫術高明
   - □(3)醫師親切尊重病人
   - □(4)醫院的聲望
   - □(5)其他(請註明)

   1-2. 如果您通常在私人診所或衛生所看糖尿病，過去一年，醫師是否曾經建議您轉診到醫院做有關糖尿病的特別檢查或治療? (可複選)
   - □(1)有，轉診做檢查, 什麼檢查：_____
   - □(2)有，轉到糖尿病特別門診做進一步治療
   - □ (3)從來沒有過

   1-3. 如果您通常是在醫院看病，醫師是否曾經介紹您到自家附近的衛生所或診所繼續追蹤糖尿病？
   - □ (1)有
   - □ (2)沒有

2. 平常幫您治療糖尿病的醫師是
   □(1)糖尿病專科醫師 □(2)家庭醫學科醫師 □(3)其他內科醫師 □(4)外科醫師 □(5)其他(請註明)：_____ □(6)不知道
3. 除非醫師有特別轉診，您會找固定的醫師看糖尿病
   □(1) 完全沒有 □(2) 很少 □(3)普通 □(4) 經常 □(5) 總是

4. 爲我看糖尿病的醫師有囑咐我去眼科檢查眼睛
   □ (1)有
   □ (2)沒有(請跳答第 5 題)

4-1. 過去一年，您是否曾依照醫師的囑咐去檢查眼睛?
   □ (1)有
   □ (2)沒有(請跳答第 5 題)

4-2. 如果有去眼科檢查眼睛，是否有在檢查前點一種會讓視力模糊的藥水?
□(1)有 □(2)沒有

5. 最近一年曾有醫療照護人員打電話或到家裡訪問、關心並指導您有關糖尿病的自我照護？
□有 □沒有

5-1. 他們是什麼專業人員?
□(1)護士 □(2)營養師 □(3)醫師 □(4)社工人員 □(5)其他：_____ □(6)不知道

6. 每次看糖尿病門診時，醫師會告訴我下次再來門診的時間
□(1)總是 □(2)經常 □(3)普通 □(4)很少 □(5)完全沒有

7. 我通常去門診看糖尿病一次總共需花費的時間(連交通時間、等候時間，以及看診時間)
□(1)小於 30 分鐘 □(2)30 分鐘到 1 小時 □(3)1-2 小時 □(4)2-3 小時
□(5)3-4 小時 □(6)4 小時以上

7-1. 通常來回的交通時間總共需要
□(1)小於 30 分鐘 □(2) 30 分到 1 小時 □(3) 1-2 小時 □(4)2-3 小時
□(5)3 小時以上

7-2. 通常每次等候看診的時間
□ (1)小於 15 分 □(2)15-30 分 □(3)30-45 分 □(4)45 分到 1 小時
□ (5)1-2 小時 □(6)2 小時以上

7-3. 通常每次醫師實際診治的時間
□(1)不到 3 分鐘 □(2)3-5 分鐘 □(3)5-10 分鐘 □(4)10-15 分鐘 □(5)15-20 分鐘 □(6)20 分鐘以上

8. 我覺得要到門診看糖尿病的方便性
□(1)非常方便 □(2)很方便 □(3)普通 □(4)不太方便 □(5)非常不方便

9. 通常一次門診醫師都開多久的糖尿病藥物給您？
□(1)小於 7 天 □(2)兩週 □(3)一個月 □(4)兩個月 □(5)三個月 □(6)不一定

10. 我有照醫師所囑咐的時間定期看糖尿病的門診
□(1)總是 □(2)經常 □(3)普通 □(4)很少 □(5)完全沒有

11. 我有照醫師的囑咐定期去做血糖以外的抽血檢查
□(1)總是 □(2)經常 □(3)普通 □(4)很少 □(5)完全沒有
□(6)我不記得醫師曾有囑咐我做其他抽血檢查

12. 我每次去門診看糖尿病時，會帶糖尿病護照。
□(1)總是 □(2)經常 □(3)普通 □(4)很少 □(5)完全沒有
13. 我每次去門診看糖尿病時，醫師都會查看我的糖尿病護照並登錄新的檢查結果
□(1)總是 □(2)經常 □(3)普通 □(4)很少 □(5)完全沒有
14. 過去一年內，平均多久**您本人親自**去門診看一次糖尿病？
□ (1)都沒去看 □(2)一年一次 □(3)每半年一次 □(4)每 3-4 個月一次
□ (5)每兩個月一次 □(6)每個月一次 □(7)每 2-3 週一次
□ (8)每週一次或更頻繁

B. 對專業人員的滿意度

下列問題是有關在過去一年當中，您對看糖尿病的門診醫護人員的看法，請**依您真實的感受**勾選出最適合的答案。

15. 我覺得看糖尿病的醫師在做決定如何治療或改變處方時，都會考慮我個別的狀況
□(1)總是 □(2)經常 □(3)普通 □(4)很少 □(5)完全沒有
16. 我覺得看糖尿病的醫師會解釋我的病情，例如檢查的結果和治療。
□(1)總是 □(2)經常 □(3)普通 □(4)很少 □(5)完全沒有
17. 我覺得在門診看糖尿病時，醫師解釋有關病情或治療時，讓我聽起來很清楚。
□(1)總是 □(2)經常 □(3)普通 □(4)很少 □(5)完全沒有
18. 我覺得在門診看糖尿病時，可以感受到醫師對我的的關心
□(1)總是 □(2)經常 □(3)普通 □(4)很少 □(5)完全沒有
19. 我感覺治療糖尿病的醫師尊重我
□(1)總是 □(2)經常 □(3)普通 □(4)很少 □(5)完全沒有
20. 曾經有**護士**指導您有關糖尿病的自我照顧？
□(1)有 □(2)沒有 (請跳答第 25 題)
21. 我覺得護士在指導我糖尿病的注意事項時，都有考慮我個人的狀況
□(1)總是 □(2)經常 □(3)普通 □(4)很少 □(5)完全沒有
22. 我覺得護士在對我衛教有關糖尿病自我照顧時解釋得很清楚
□(1)總是 □(2)經常 □(3)普通 □(4)很少 □(5)完全沒有
23. 我在接受糖尿病自我照顧衛教時，可以感受到護士對我的的關心
□(1)總是 □(2)經常 □(3)普通 □(4)很少 □(5)完全沒有
24. 我覺得在接受糖尿病衛教時，有受到衛教護士的尊重
□(1)總是 □(2)經常 □(3)普通 □(4)很少 □(5)完全沒有
25. 曾經有**營養師**指導您有關糖尿病的飲食控制？
□(1)有 □(2)沒有 (請跳答第 30 題)
26. 我覺得營養師在指導我糖尿病人要怎麼吃時，都有考慮我個人的狀況
□(1)總是 □(2)經常 □(3)普通 □(4)很少 □(5)完全沒有

27. 我覺得營養師在衛教如何控制飲食時解釋得很清楚
□(1)總是 □(2)經常 □(3)普通 □(4)很少 □(5)完全沒有
28. 我覺得在接受糖尿病飲食衛教時，可以感受到營養師對我的的關心
□(1)總是 □(2)經常 □(3)普通 □(4)很少 □(5)完全沒有
29. 我覺得在接受飲食衛教時，有受到營養師的尊重
□(1)總是 □(2)經常 □(3)普通 □(4)很少 □(5)完全沒有
30. 因糖尿病看門診時，我對**醫師**服務的滿意度
□(1)非常不滿意 □(2)不太滿意 □(3)普通 □(4)滿意 □(5)非常滿意
31. 我對**護士**提供糖尿病衛教的滿意度
□(1)非常不滿意 □(2)不太滿意 □(3)普通 □(4)滿意 □(5)非常滿意
□(6)不知道，沒接觸過
32. 我對**營養師**提供服務的滿意度
□(1)非常不滿意 □(2)不太滿意 □(3)普通 □(4)滿意 □(5)非常滿意
□(6)不知道，沒接觸過
33. 我對去看糖尿病門診掛號過程的滿意度
□(1)非常滿意 □(2)滿意 □(3)普通 □(4)不太滿意 □(5)非常不滿意
34. 整體來說，我對每次到門診看糖尿病的整體服務滿意度
□(1)非常不滿意 □(2)不太滿意 □(3)普通 □(4)滿意 □(5)非常滿意

C. 有關糖尿病衛教方面

35. 醫護人員曾個別指導我有關糖尿病衛教項目有哪些？(可複選，請依**最近一年內**的經驗，勾選您曾經接受過指導的項目及各個曾經指導過您的人員)
□ 35-1. 糖尿病用藥
由誰指導？(可複選)
□(1)醫師 □(2)護理人員 □(3)營養師 □(4)其他(請註明)_____ □(5)不記得是誰指導 □(6)不曾有醫護人員指導過
□ 35-2. 飲食
由誰指導？(可複選)
□(1)醫師 □(2)護理人員 □(3)營養師 □(4)其他(請註明)_____ □(5)不記得是誰指導 □(6)不曾有醫護人員指導過
□ 35-3. 運動
由誰指導？(可複選)
□(1)醫師 □(2)護理人員 □(3)營養師 □(4)其他(請註明)_____ □(5)不記得是誰指導 □(6)不曾有醫護人員指導過
□ 35-4. 足部照護
由誰指導？(可複選)

□(1)醫師 □(2)護理人員 □(3)營養師 □(4)其他(請註明)_____ □(5)不記得是誰指導 □(6)不曾有醫護人員指導過

□ 35-5. 低血糖預防與處理
由誰指導？(可複選)
□(1)醫師 □(2)護理人員 □(3)營養師 □(4)其他(請註明)_____ □(5)不記得是誰指導 □(6)不曾有醫護人員指導過

□ 35-6.高血糖的預防與處理
由誰指導？(可複選)
□(1)醫師 □(2)護理人員 □(3)營養師 □(4)其他(請註明)_____ □(5)不記得是誰指導 □(6)不曾有醫護人員指導過

□ 35-7. 有關糖尿病若未好好控制可能引起的慢性合併症
由誰指導？(可複選)
□(1)醫師 □(2)護理人員 □(3)營養師 □(4)其他(請註明)_____ □(5)不記得是誰指導 □(6)不曾有醫護人員指導過

□ 35-8. 自我監測血糖
由誰指導？(可複選)
□(1)醫師 □(2)護理人員 □(3)營養師 □(4)其他(請註明)_____ □(5)不記得是誰指導 □(6)不曾有醫護人員指導過

□ 35-9. 有關抽煙
由誰指導？(可複選)
□(1)醫師 □(2)護理人員 □(3)營養師 □(4)其他(請註明)_____ □(5)不記得是誰指導 □(6)不曾有醫護人員指導過

□ 35-10. 情緒壓力的處理
由誰指導？(可複選)
□(1)醫師 □(2)護理人員 □(3)營養師 □(4)其他(請註明)_____ □(5)不記得是誰指導 □(6)不曾有醫護人員指導過

36. 最近一年內，醫師曾經介紹我給哪些醫護人員接受糖尿病衛教或其他協助？
(可複選) □(1)護理人員 □(2)營養師 □(3)社工員 □(4)醫師從未介紹過

37. 過去一年，是不是曾有醫護人員請您脫下鞋襪檢查您的腳?
□(1)是 □(2)否

第二部份　糖尿病自我照顧活動問卷

下列是問您有關過去一個禮拜內(指的是從現在往回推算七天)您的糖尿病自我照護活動，若過去一個禮拜您剛好生病，則請回憶生病前的一個禮拜. 請將您有做到的天數圈起來。例如：

題目問：過去一個禮拜內有多少天您有在家測試您的血糖？

如果您都沒有測試，則請在「0」處圈起來

(0) 1 2 3 4 5 6 7

部份題目後面還列出幾種狀況，請在適合您的狀況前面的 □ 內打勾

1. 過去一個禮拜七天內有多少天您有依照均衡的飲食方式來攝食？
   0 1 2 3 4 5 6 7
2. 過去一個月內，平均一個禮拜七天內有多少天您會按照醫護人員教您的飲食計劃吃東西？
   0 1 2 3 4 5 6 7
3. 過去一個禮拜內有多少天您有吃到高脂肪食物，如肥豬肉, 用豬油炒菜、雞皮，油炸的食物、奶油或全脂牛奶？
   0 1 2 3 4 5 6 7
4. 過去一個禮拜內有多少天您有吃到五份以上的蔬菜或水果(一份青菜是一小碟，一份的水果大約是半個拳頭大小的水果如：半個蘋果，半根香蕉)？
   0 1 2 3 4 5 6 7
   □4-1.您多吃蔬菜，但很少吃水果。
   □4-1-1 您不敢吃太多水果。
   □4-2.您多吃水果，但不喜歡吃蔬菜。
5. 過去一個禮拜內有多少天您有進行 30 分鐘以上的身體活動 (連續活動 30 分鐘以上，包括走路)？
   0 1 2 3 4 5 6 7
   □5-1.我有都有做身體活動，但每天不到 30 分鐘。
6. 除了您每天例行在家中的活動或工作需求的活動之外，過去一個禮拜內有多少天您有參加特別的運動 (例如游泳、散步、騎腳踏車、打球) ？
   0 1 2 3 4 5 6 7
7. 過去一個禮拜內有多少天您或您的家人有測試您的血糖？
   0 1 2 3 4 5 6 7
8. 過去一個禮拜內有多少天您或您的家人有依照醫療人員建議的次數來測試您的血糖？
   0 1 2 3 4 5 6 7
9. 過去一個禮拜內有多少天您有檢查您的腳？
   0 1 2 3 4 5 6 7
10. 過去一個禮拜內有多少天您會檢查您的鞋子裡面？
    0 1 2 3 4 5 6 7

□10-1.我通常都穿拖鞋或涼鞋

11. 過去一個禮拜內有多少天您有抽煙---即使只是吸一口？

0 1 2 3 4 5 6 7

□11-1(1)沒有抽煙

□11-2(2)有抽煙.

11-2-2.如果有的話，平均一天抽幾根？

自我照顧建議

1R. 下列哪些項目是醫護人員 (醫師、護理人員、營養師、或糖尿病衛教人員) 曾經指導您在飲食上的注意事項 (可複選，請勾選每個符合的項目)：

□ a. 要均衡飲食

□ b. 依照一個如何分配三餐和點心的飲食計劃。

□ c. 要吃低脂肪食物。

□ d. 減少熱量 (卡路里) 攝取數以減輕體重。

□ e. 多吃蔬菜水果 (至少一天五份)。

□ f. 少吃甜食 (包括各種甜點以及含糖飲料)。

□ g. 其他 (請註明)：

□ h. 醫護人員從未給我任何有關糖尿病飲食的建議。

2R. 下列哪些項目是醫護人員 (醫師、護理人員、營養師、或糖尿病衛教人員) 曾經提供您有關運動的指導 (可複選，請勾選每個符合的項目)：

□ a. 要常做運動

□ b. 一個禮拜至少運動三次，每次至少 20 分鐘。

□ c. 將運動融入成爲您每天生活的一部份 (例如停車停遠一點以便散步運動)。

□ d. 進行一項有特定的運動量、型態、時間長短、和程度的運動。

□ e. 其他 (請註明)：

□ f. 醫療人員從未給我任何運動的建議。.

3R. 下列哪些項目是醫護人員 (醫師、護理人員、營養師、或糖尿病衛教人員) 曾經指導您要做檢驗的事 (可複選，請勾選每個符合的項目)：

□ a. 自己用血糖機驗血糖。

□ b. 依照醫師的指示到鄰近社區內醫療院所或檢驗所驗血糖。

□ c. 驗尿糖

□ d. 其他 (請註明)：

□ e. 醫療人員從未指導我自我檢查我的血糖或自我檢測尿糖。

4R. 下列哪些藥物是醫師開給您糖尿病的處方：

□ a. 只有注射胰島素

□(a1)每天注射胰導素一或兩次。

□(a2)每天注射胰島素三次以上。

□ b. 只有口服降血糖藥物。

□(b1)控制血糖的口服藥一天一次或兩次

□(b2)控制血糖的口服藥三次以上

□ c. 口服降血糖藥加注射胰島素
□ d. 其他 (請註明)：
□ e. 醫師並沒有爲了我的糖尿病開胰導素或治療糖尿病口服藥的處方。

5R. 下列哪些項目是醫護人員 (醫師、護理人員、營養師、或糖尿病衛教人員) 曾經指導您要做的事 (可複選，請勾選每個符合的項目)：
□ a. 每天檢查您的腳。
□ b. 每天洗腳。
□ c. 洗腳後擦乾腳趾縫。
□ d. 糖尿病人穿鞋需注意事項。
□ e. 醫療人員從未指導我有關腳的照護。

6R. 在您之前門診看醫師，有沒有任何醫護人員問您抽煙的狀況？
□ 有 □沒有

7R. 如果您有抽煙，在過去的門診，有沒有醫護人員和您談過如何戒菸？或者是轉介您去參加戒菸班？
□ 有 □沒有 □沒有抽煙

藥物

醫師有否開口服降血糖藥物處方？□沒有 □有 (請回答 5A 和 6A)

5A. 如果醫師有開口服降血糖藥物，過去一個禮拜內有多少天您有服用醫師開的糖尿病藥物？
0 1 2 3 4 5 6 7

6A. 過去一個禮拜內有多少天您有依醫師開的服藥時間服用治療糖尿病的藥物？
0 1 2 3 4 5 6 7

醫師有否開胰導素注射的處方？□沒有 □有 (請回答 7A 和 8A)

7A. 如果醫師有開胰島素，過去一個禮拜內有多少天您有注射胰導素？
0 1 2 3 4 5 6 7

8A. 過去一個禮拜內有多少天您有依醫師建議的次數注射胰導素？
0 1 2 3 4 5 6 7

腳的護理

9A. 過去一個禮拜內有多少天，您有洗腳？
0 1 2 3 4 5 6 7

10A. 過去一個禮拜內有多少天，您在洗腳後會擦乾腳趾縫？
0 1 2 3 4 5 6 7

抽煙

11A. 您上次抽煙是在什麼時候？
□ 超過兩年以前，或未曾抽煙
□ 1-2 年前 □4-12 個月前 □1-3 個月前 □上一個月內 □上一週內 □今天

12A. 平均一天抽多少根？_____

第三部份　生活品質問卷

問卷說明：

這份問卷詢問您對於自己的生活品質、健康、以及其他生活領域的感覺。請您回答所有的問題。如果您對某一問題的回答不確定，請選出五個答案中最適合的一個，通常會是您最早想的那個答案。

我們的問題所關心的是您**最近一個月**的生活情形，請您用自己的標準、希望、愉快、以及關注點來回答問題。請仔細閱讀每個題目，並評估您自己的感覺，然後就每一個題目選出最適合您的答案。謝謝您的協助！

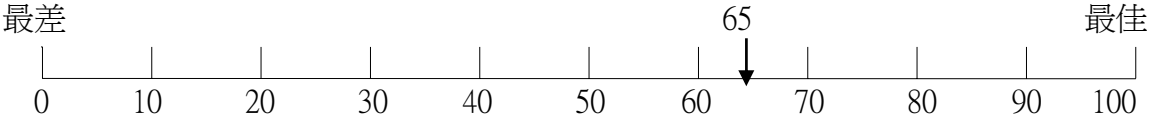
1. 整體來說，您如何評價您的生活品質？
   □極不好　□不好　□中等程度好　□好　□極好
2. 整體來說，您滿意自己的健康嗎？
   □極不滿意　□不滿意　□中等程度滿意　□滿意　□極滿意
3. 您覺得身體疼痛會妨礙您處理需要做的事情嗎？
   □完全沒有妨礙　□有一點妨礙　□中等程度妨礙　□很妨礙　□極妨礙
4. 您需要靠醫療的幫助應付日常生活嗎？
   □完全沒有需要 □有一點需要　□中等程度需要　□很需要　□極需要
5. 您享受生活嗎？
   □完全沒有享受　□有一點享受　□中等程度享受　□很享受　□極享受
6. 您覺得自己的生命有意義嗎？
   □完全沒有　□有一點有　□中等程度有　□很有　□極有
7. 您集中精神的能力有多好？
   □完全不好　□有一點好　□中等程度好　□很好　□極好
8. 在日常生活中，您感到安全嗎？
   □完全不安全　□有一點安全　□中等程度安全　□很安全　□極安全
9. 您所處的環境健康嗎？ (如污染、噪音、氣候、景觀)
   □完全不健康　□有一點健康　□中等程度健康　□很健康　□極健康
10. 您每天的生活有足夠的精力嗎？
    □完全不足夠　□少許足夠 □中等程度足夠 □很足夠 □完全足夠
11. 您能接受自己的外表嗎？
    □完全不能夠　□少許能夠　□中等程度能夠 □很能夠 □完全能夠
12. 您有足夠的金錢應付所需嗎？
    □完全不足夠　□少許足夠 □中等程度足夠　□很足夠　□完全足夠
13. 您能方便得到每日生活所需的資訊嗎？
    □完全不方便　□少許方便　□中等程度方便　□很方便　□完全方便
14. 您有機會從事休閒活動嗎？
    □完全沒有機會 □少許機會 □中等程度機會 □很有機會 □完全有機會
15. 您四處行動的能力好嗎？
    □完全不好　□有一點好　□中等程度好　□很好　□極好

16. 您滿意自己的睡眠狀況嗎？
□極不滿意 □不滿意 □中等程度滿意 □滿意 □極滿意
17. 您對自己從事日常活動的能力滿意嗎？
□極不滿意 □不滿意 □中等程度滿意 □滿意 □極滿意
18. 您滿意自己的工作能力嗎？
□極不滿意 □不滿意 □中等程度滿意 □滿意 □極滿意
19. 您對自己滿意嗎？
□極不滿意 □不滿意 □中等程度滿意 □滿意 □極滿意
20. 您滿意自己的人際關係嗎？
□極不滿意 □不滿意 □中等程度滿意 □滿意 □極滿意
21. 您滿意自己的性生活嗎？
□極不滿意 □不滿意 □中等程度滿意 □滿意 □極滿意
22. 您滿意朋友給您的支持嗎？
□極不滿意 □不滿意 □中等程度滿意 □滿意 □極滿意
23. 您滿意自己住所的狀況嗎？
□極不滿意 □不滿意 □中等程度滿意 □滿意 □極滿意
24. 您對醫療保健服務的方便程度滿意嗎？
□極不滿意 □不滿意 □中等程度滿意 □滿意 □極滿意
25. 您滿意所使用的交通運輸方式嗎？
□極不滿意 □不滿意 □中等程度滿意 □滿意 □極滿意
26. 您常有負面的感受嗎？（如傷心、緊張、焦慮、憂鬱等）
□從來沒有 □不常有 □一半有一半沒有 □很常有 □一直都有
27. 您覺得自己有面子或被尊重嗎？
□完全沒有 □有一點有 □中等程度有 □很有 □極有
28. 您想吃的食物通常都能吃到嗎？
□從來沒有 □不常有 □一半有一半沒有 □很常有 □一直都有

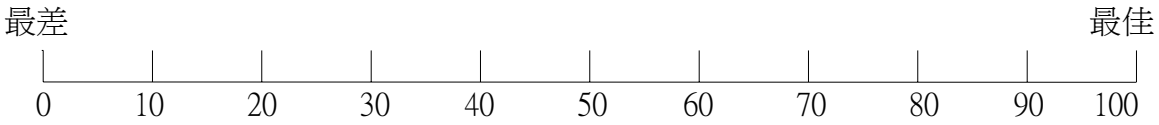
綜合自我評估

以上問題都是問您健康相關生活品質，請依您**最近兩個星期**的情況，回答下列題目;「0」端代表生活品質**最差**的狀態,「100」端代表生活品質**最佳**的狀態,根據此觀點，請在下列的長條圖中，以**箭頭及數字**的的方式，
標出您的情況，謝謝。

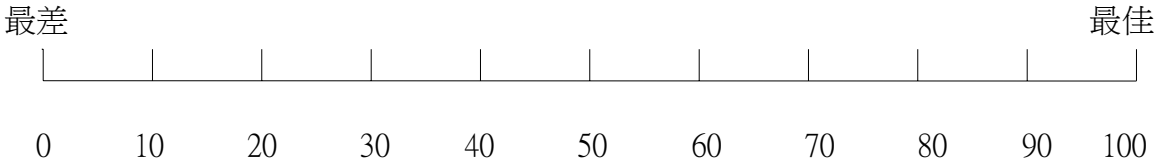
例如： 整體而言，我對自己健康相關生活品質的滿意程度。



1. 綜合而言，我對自己健康相關生活品質的滿意程度。



2. 綜合而言，我在得糖尿病之前，我對健康相關生活品質的滿意程度。



〔1〕自覺個人健康狀況：1□很差 2□差 3□不好不壞 4□好 5□很好
〔2〕整體來說，您覺得目前生活過得快樂嗎？
1□很不快樂 2□不太快樂 3□還算快樂 4□快樂 5□很快樂

第四部分：糖尿病個人資料表

1. 性別：□(1)男 □(2)女
2. 年齡： 生日：民國__年 _月 _日
□(1)18-29 □(2)30-39 □(3)40-49 □(4)50-64 □(5)65-74 □(6)>75
3. 教育程度：
□(1)無 □(2)小學 □(3)初中 □(4)高中 □(5)大專以上
4. 職業：□(1)無 □(2)軍 □(3)公 □(4)教 □(5)工 □(6)商
□(7)其他：_____
4-1. 職業性質：
□(1)工作時間和地點皆固定 □(2)工作地點不固定
□(3)工作時間不固定 □(4)工作時間和地點皆不固定
5. 婚姻狀況 □(1)未婚/單身 □(2)已婚/同居 □(3)離婚/分居 □(4)矜寡
6. 族裔 (單選，若父母不同，則請選擇您**生活習慣**上比較認同的一種)
□(1)外省 □(2)閩南(福佬) □(3)客族 □(4)阿美族 □(5)泰雅族
□(6)其他：___
7. 主要語言 (單選，請選擇生活上最常用的一種)：
□(1)國語 □(2)閩南語 □(3)客語 □(4)阿美族語 □(5)泰雅族語
□(6)其他：_____
8. 您現在和誰住一起？
□(1)我自己一個人獨居
□ (2)我有家人同住 (請續答 8-1)
8-1. 和您同住的人是 (可複選，)
□(1)配偶 □(2)後代子孫或媳婿 □(3)直系父母或祖父母
□(4)其他親戚 (請註明關係)：_____ □(5)朋友
和您同住的如有多位，請寫出您認爲最重要的關係：_____
9. 健康保險：
□(1)除全民健保外，另有私人保險 □(2)只有全民健保 □(3)無任何健康保險
10. 月平均收入大約爲：_____
11. 診斷爲糖尿病的時間：民國 _____年_____月, 至今已_____年_____個月.
□(1)1-2 年內 □(2)2-5 年之間 □(3)5-10 年之間 □(4)10 年以上
12. 您是否有糖尿病合併症：
□ 1.不知道 2.沒有 3.有 (請續答 12-1)
12-1. 如果有，請勾選您曾經歷過的合併症 (可複選)
□(1)白內障 □(2)視網膜病變 □(3)腎臟病(腰子的問題) □(4)心臟病
□(5)神經病變(帶手套的手部或穿襪子的足部會有麻的感覺) □(6)足部問題 (如足部傷口不易癒合，曾補皮或截肢)
13. 除了糖尿病之外，您是否有其他慢性病？
□(1)沒有 □(2)有(請續答 13-1)

13-1. 如果有，請勾選您現有的其他慢性病 (可複選)

□(1)高血壓 □(2)高膽固醇(血濁) □(3)退化性關節炎 □(4)肺結核

□(5)其他(請註明)：

14. 您去年是否曾經因糖尿病或合併症住院？

□(1)沒有 □(2)住院一次 □(3)住院兩次 □(4)住院三次以上

14-1. 一次住院多久：a.第一次____天，b.第二次____天，c.第三次____天

_____

14-2. 住院診斷是什麼?：a. 第一次_____，

b. 第二次_____，c. 第三次_____

_____

15. 您前一年血糖控制通常大約爲多少：飯前：_____ (2)飯後：_____

□不知道

16. 您最近一次飯前血糖是在_____天前 (日期_____) 檢驗的?

當時血糖值多少(1)：_____ □(2)不知道

17. 最近一年您曾經接受糖尿病衛教嗎？

□1.沒有 □2.有(請續答 17-1, 17-2)

17-1.接受衛教的形式爲 (可複選，請勾選下列適當的項目)

□1.個別衛教 □2.小組討論形式的團體衛教 □3.演講形式團體衛教

17-2. 過去一年您曾接受糖尿病衛教的時間一共大約爲？

□(1)2 小時以下 □(2)2-4 小時 □(3)4-6 小時 □(4)6-8 小時

□(5)8 小時以上

17-3. 您的家人曾經參加過任何形式的糖尿病衛教嗎？

□(1)有 □(2)沒有

18. 您最近糖尿病藥物治療方式爲

□(1)只有飲食控制 □(2)只有口服降血糖藥 □(3)只有注射胰導素

□(4)口服降血糖藥加注射胰導素

19. 您有沒有一本糖尿病護照？

□(1)有，還在 □(2)曾經有，但已遺失 □(3)不曾有過

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VITA

Shu-Chuan Chang was born in Taichung, Taiwan on December 18, 1959, the daughter of Ching-Li Chang and Shiu-Feng Tang Chang. After completing her work at the Provincial Taichung Girls High School in 1978, she entered the National Taiwan University (NTU). She received her Bachelor of Science Degree in Nursing in 1982. During the following six years, she worked as a clinical staff nurse in an adult intensive care unit and served as acting head nurse of the pediatric intensive care unit of the NTU Hospital. She also had the privilege to serve as an assistant instructor at the School of Nursing at NTU. She began her work at the Graduate Institute of Nursing in NTU in 1988. Meanwhile, she was also employed as a research assistant for Dr. Yueh-Chih Chen's project funded by the National Science Research Council, followed by the opportunity to teach at the Tzu-Chi Junior College of Nursing in Hualien, Taiwan. In January 1992, with a thesis entitled, "Maternal Conceptualization in Relation to Their High-Risk Neonates during the Postpartum Period," she received her Master's Degree from NTU. Over the course of the next eight years, she was employed as a nurse supervisor and later director of the Nursing Department in Tzu-Chi Medical Center, while continuing to teach at the School of Nursing at Tzu-Chi University in Hualien, Taiwan. In the fall of 2000, she entered the School of Nursing at the University of Texas at Austin to work towards a doctorate in Nursing Systems.

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